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EUROPEAN ATOMIC ENERGY COMMUNITY

REPORT

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

Second Review Meeting of the Contracting Parties

(submitted by the European Commission)

TABLE OF CONTENTS

1.	EXECUTIVE SUMMARY	5
2.	EURATOM COMPETENCES IN THE FRAMEWORK OF THE JOINT CONVENTION ON THE SAFETY OF SPENT FUEL AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT (<i>SECTION A</i>).....	5
2.1.	Legal background for the accession of the European Atomic Energy Community to the Joint Convention.....	5
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.....	6
3.	EURATOM POLICIES AND PRACTICES WITH REGARD TO RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT (<i>SECTION B. POLICIES AND PRACTICES</i>).....	7
3.1.	General Euratom policies	7
3.2.	Euratom policies in the framework of the Joint Research Centre (JRC).....	9
3.2.1.	General introduction to the JRC	9
3.2.2.	Brief overview of JRC installations and work.....	9
3.2.3.	JRC policies and practices.....	10
4.	SCOPE OF APPLICATION (<i>SECTION C</i>)	12
5.	INVENTORIES AND PRACTICES IN EURATOM FACILITIES (<i>SECTION D</i>)	12
5.1.	JRC Geel (Belgium)	12
5.2.	JRC Karlsruhe (Germany).....	13
5.3.	JRC Petten (Netherlands)	16
5.4.	JRC Ispra (Italy).....	16
5.5.	European Commission premises in Luxembourg.....	20
6.	EURATOM'S LEGISLATIVE AND REGULATORY FRAMEWORK (<i>SECTION E. LEGISLATIVE AND REGULATORY SYSTEM - ARTICLE 19 OF THE JOINT CONVENTION</i>)	21
7.	IMPLEMENTING MEASURES (<i>ARTICLE 18 OF THE JOINT CONVENTION</i>).....	22
8.	OTHER GENERAL SAFETY PROVISIONS (<i>SECTION F</i>)	22
8.1.	Responsibility of the licence holder (<i>Article 21 of the Joint Convention</i>)	22
8.2.	Operational radiation protection (<i>Article 24 of the Joint Convention</i>).....	23
8.3.	Emergency preparedness (<i>Article 25 of the Joint Convention</i>)	23

8.4.	Decommissioning (<i>Article 26 of the Joint Convention</i>)	24
9.	REQUIREMENTS WITH REGARD TO SAFETY OF SPENT FUEL MANAGEMENT AND SAFETY OF RADIOACTIVE WASTE MANAGEMENT (<i>SECTIONS G AND H</i>).....	25
9.1.	General safety requirements (<i>Articles 4 and 11 of the Joint Convention</i>)	25
9.2.	Siting of proposed facilities (<i>Articles 6 and 13 of the Joint Convention</i>)	26
9.3.	Design and construction of facilities (<i>Articles 7 and 14 of the Joint Convention</i>)	26
9.4.	Assessment of safety of facilities (<i>Articles 8 and 15 of the Joint Convention</i>)	27
9.5.	Operation of facilities (<i>Articles 9 and 16 of the Joint Convention</i>).....	27
10.	TRANSBOUNDARY MOVEMENT (<i>SECTION I - ARTICLE 27 OF THE JOINT CONVENTION</i>)	28
10.1.	Council Directive on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community.....	28
10.2.	Euratom Regulation on shipments of radioactive substances between Member States	28
11.	DISUSED SEALED SOURCES (<i>SECTION J – ARTICLE 28 OF THE JOINT CONVENTION</i>)	29
12.	OTHER EURATOM ACTIVITIES TO SUPPORT THE SAFETY OF RADIOACTIVE MANAGEMENT AND THE SAFETY OF SPENT FUEL MANAGEMENT	31
12.1.	Euratom loans	31
12.2.	Situation reports.....	31
12.3.	Euratom Research Framework Programmes	32
13.	THE WAY AHEAD TO IMPROVE SAFETY THROUGHOUT THE EURATOM COMMUNITY (<i>SECTION K</i>).....	32
ANNEX I	OPERATIONAL RADIATION PROTECTION.....	33
ANNEX II	RESEARCH	36

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 Second Review Meeting of the Contracting Parties, to be held in Vienna from 15 to 26 May 2006.

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).

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.

¹ Article 101.

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 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”.

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, the Republic of Cyprus, the Republic of Latvia, the Republic of Lithuania, the Grand Duchy of Luxembourg, the Republic of Hungary, the Republic of Malta, the Kingdom of the Netherlands, the Republic of Austria, the Republic of Poland, the Portuguese Republic, the Republic of Slovenia, the Slovak Republic, the Republic of 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 3 500 te of spent fuel (of which 1 700 te is currently intended for direct disposal) and 40 000 m³ of radioactive waste are currently produced every year in the European Union. 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 concerns 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.

Nowadays 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 by the Green Paper on security of energy supply⁷ concluded that nuclear energy would remain an option for the future in Europe, if the general public felt that management of nuclear waste was being properly handled.

However, although some progress has been observed on the less hazardous categories of radioactive waste, all accumulations of the more hazardous high-level and long-lived wastes (including spent fuel for direct disposal) are currently being

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.

stored in surface or near-surface facilities pending the availability of more permanent solutions. No country has yet moved on to disposal of these wastes, and the degree of progress towards a solution varies considerably from country to country. Only a few countries have established programmes for the development of geological disposal. Some Member States are reassessing all 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.

Alternative solutions are under investigation, in particular partitioning and transmutation (P&T) and long-term storage. In the case of P&T, research is still needed. P&T would not completely remove the hazards posed by radioactive wastes, some of which are not suitable for reprocessing and will still require safe management for many hundreds of years.

Surface and sub-surface storage could also be an option: while envisaged by most experts in the short- to medium-term, it is not seen as sustainable in the longer term. Therefore, for at least some forms of waste, many experts believe that deep geological repositories appear – for the time being – to be the preferred option available, even though there may be a need to ensure reversibility. In addition, the effect of the decision on public perception should not be underestimated.

A recent poll⁸ conducted 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. For the European Commission this was a major driving force behind the preparation of two Council Directives covering the safety of nuclear installations and the management of radioactive waste and spent fuel⁹.

The draft Safety Directive lays down basic obligations and general principles on the safety of all types of nuclear installations. The proposed Directive on the management of radioactive waste and spent fuel would require Member States to define programmes for the long-term management of all their radioactive wastes. These programmes would be peer reviewed by a committee that would be composed of representatives of the regulatory bodies designated by each Member State, with the Commission acting as the Secretariat. These programmes would detail which types and quantities of waste are involved, which technology would be used for their management, and the timetable for construction and operation of the different facilities needed.

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 COM(2004) 526 final.

The European Parliament adopted its opinion on both proposals in January 2004. Following its in-depth consideration of the two proposals the Council concluded in June 2004 that Member States together with the Commission should engage in a wide ranging consultation process facilitating the choice of instrument(s), in the framework of the Euratom Treaty, that can contribute more effectively to achieving nuclear safety and the safe management of spent fuel and radioactive waste.

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"¹⁰ 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, and possibly not until 2025, or even later, for Geel and Karlsruhe. Nevertheless, in accordance with the IAEA's recommendations, the European Commission intends to draw up decommissioning plans for the installations in operation before decommissioning operations start.

¹⁰ D&WM: Decommissioning and Waste Management.

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 Parliament¹¹. 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 2004¹².

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.

3.2.3.2. Spent fuel management practices

In Petten spent fuel from the HFR¹³ is either shipped to an intermediate storage facility managed by COVRA¹⁴, 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 reprocessing route is currently being followed for a batch of irradiated material no longer relevant to research activities. At Ispra the matter is still open since Italy is now contemplating the idea of reprocessing the spent fuel originating from its own power plants and other facilities. The fuel remaining in Ispra could follow one of three routes:

- reprocessing, which should avoid the need to produce specialised packaging for disposal. However, certain “exotic” fuels are not suitable for reprocessing in an industrial facility. In addition, primary and secondary wastes arising from reprocessing will be returned for disposal in the repository of the host country;
- dry storage in dual-purpose casks, pending shipment to the national repository;
- transfer of ownership to a third party.

¹¹ COM(1999) 114.

¹² SEC(2004) 621.

¹³ High Flux Reactor.

¹⁴ Centrale Organisatie Voor Radioactief Afval.

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 NRG¹⁵, the operator and licence holder of the HFR, and then transferred to COVRA. From Geel waste is transferred to ONDRAF/NIRAS¹⁶ 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, ITU¹⁷ 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 some waste management facilities in order to treat, characterise, process, condition and package properly the existing waste and that arising from dismantling operations.

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 general criteria are in force for free release of materials. Radioactive materials can be unconditionally released from regulatory control, after obtaining the pertinent authorisation, if the radionuclides concerned comply with both a concentration and a radioactive half-life threshold:

$$C \leq 1 \text{ Bq/g and}$$

$$T_{1/2} < 75 \text{ days.}$$

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:

- 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.

¹⁵ Nuclear Research and Consultancy Group.

¹⁶ Organisme national des déchets radioactifs et des matières fissiles enrichies/Nationale instelling voor radioactief afval en verrijkte splijtstoffen.

¹⁷ Institute for Transuranium Elements.

- 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-CEN¹⁸ 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.

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

¹⁸ Studiecentrum voor Kernenergie - Centre d'étude de l'Energie Nucléaire.

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.

The small 3.7 MeV Van de Graaff accelerator ceased operation in 2000 and was dismantled in 2001.

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 Ministry of Energy 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 ITU¹⁹ 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, some twenty of which are dismantled each year.

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.

¹⁹ Institute for Transuranium Elements.

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.

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 is still under evaluation. The ITU pays an annual fee (€500 000) 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. By September 2005 some 200 glove boxes, including related equipment, had been dismantled. 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 1960 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 alpha-immunotherapy studies. This activity 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)

The only activity in Petten in connection with its "historical liabilities" from 1999 to 2003 was the processing of a consignment of spent fuel originating from the period when the reactor was the subject of a Community research programme.

Since 1996 as the Petten High Flux Reactor (HFR) is being used provisions are being set aside for decommissioning it. These will total €7.4 million by the end of 2006. The final amount of the provisions will depend on the date of final shutdown of the HFR. However, it will probably cover less than a third of the estimated decommissioning budget (€69 million), assuming shutdown between 2015 and 2020.

Decommissioning of the Petten HFR is not envisaged before 2015 (although 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 operation of the HFR.

The HFR is a 45 MW research reactor, in operation since 1961. Its exceptional number of full-power days in operation (more than 280 days per year) and its high utilisation rate (between 75 and 80% of the useful irradiation space) make it one of the best performing European installations of its kind. Like most multi-purpose research reactors, neutrons are available for irradiation in the reactor core itself (19 locations with fast and thermal neutron fluxes), outside the reactor vessel in the shielding pool (thermal neutron fluxes used mainly for nuclear fuel testing and radioisotope production), and in neutron beams brought outside the reactor.

The plant itself is in excellent condition, as demonstrated by the regular achievement of its planned operating schedule. The reactor's pressure vessel was renewed in 1984. The new vessel is expected to remain in use beyond 2015. Therefore, the liabilities associated with the HFR have to be seen as "future liabilities". A radiological enquiry was launched in 2004 to obtain an updated understanding of the future liabilities from the HFR. Its outcome is currently under review.

5.4. JRC Ispra (Italy)

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 repository 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 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 largely underway. 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” activities²⁰ have started. They include dismantling the shut-down VLLW²¹ incinerator and dismantling the cooling tower of the Ispra-1 reactor²², 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.).

Radiation protection

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.

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

²⁰ 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.

²¹ Very Low Level Waste.

²² The first small research reactor in Italy.

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. Specific action is being conducted to strengthen the dialogue with the Italian authorities with the aim of speeding up the licensing procedures.

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

Modernisation and/or provision of waste management installations

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

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. A series of non-nuclear and nuclear calibration tests is taking place, to be followed by the nuclear commissioning programme involving APAT²³. This programme will end in 2006, with the consequent 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.

²³ Agenzia per la protezione dell'ambiente e i servizi tecnici.

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), the drum size being the nominal standard envisaged for the final repository in Italy.

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 (LCSR²⁴), from the ESSOR²⁵ 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 routine waste. 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. The status report on the ESSOR complex has been updated and forwarded to the regulatory authority. This report forms the basis for launching a thorough radiological characterisation of the installation. Still in the ESSOR complex, the PETRA²⁶ experimental installation has been partially removed to allow temporary storage of spent fuel before proceeding with handling operations to transfer it into transportation casks. U-getters from Ethel²⁷ have been dismantled and tritium has been removed. Ethel has been declassified and can now eventually be transferred to a third party in the framework of the research supporting the fusion programme.

Preparations have started to increase the safety of future pre-decommissioning and decommissioning activities at the Ispra-1 reactor. A complex operation to recover and dry store most of the radioactive materials previously stored in the pond has been successfully completed. Other operations have been completed (removal of the cooling tower). The new status report has been drafted.

²⁴ Laboratorio Caldo Studi e Ricerche.

²⁵ ESSais ORgel, a 25 MW experimental reactor constructed in the mid-1960s.

²⁶ Process Evaluation and Testing for Radwaste management.

²⁷ European Tritium Handling Experimental Laboratory.

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. The first measures at this facility were to reduce the size of the controlled area and to remodel the building layout, ventilation system, auxiliary services, personnel routes and clearance. Operations are now completed and the new status report has been drafted.

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).

FARO²⁸ 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 holds 140 low-activity sealed radioactive sources. The 65 gamma sources, 32 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. A large majority of the sources are stored in specific locations on the premises of the European Commission in Luxembourg.

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

²⁸ Fuel Assemblies (melting) Release Oven.

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. The radioactivity measurements are regularly reported to Luxembourg's competent authorities.

**6. EURATOM'S 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/Euratom²⁹ 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

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

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”, 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.

While the 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 delivered³⁰.

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”³¹. 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*)³²

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.

³⁰ Article 37 of the Euratom Treaty. 2005 Report (not yet published).

³¹ Judgment of the Court of 10 December 2002, case C-29/99, *Commission v Council*, ECR 2002, p. I-11221.

³² For further information see Annex I.

In addition Decision 87/600/Euratom³³ makes arrangements for the early exchange of information in the event of a radiological emergency (ECURIE).

At international level this competence is reflected in the recent accession of Euratom to the Convention on Early Notification of a Nuclear Accident³⁴ and the Convention on Assistance in the Case of a Nuclear Accident³⁵.

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/Euratom³⁶ 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:

Nuclear installations, research reactors and hot cell facility at the Risø National Laboratory (DK); Hinkley Point A NPP (UK); Mülheim-Kärlich NPP (D); TRIGA HD I and II research reactor at Heidelberg (D); Bradwell NPP (UK); Stade NPP (D); various installations at CIEMAT (ES); remainder of the FRF2 research reactor at Frankfurt am Main (D); Calder Hall NPP (UK); Windscale Pile Reactor Chimneys

³³ 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.

³⁴ Not yet published.

³⁵ Not yet published.

³⁶ OJ L 324, 16.12.1999, p. 23.

(UK); Dungeness A NPP (UK); Dounreay Site - Restoration Plan (UK); and the TRIGA Mark-I research reactor at the Medical University of Hanover (D).

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 ...”.

The decommissioning of nuclear plants is set to become an increasingly important issue in the years ahead. It is assumed that more than one third of the 148 reactors currently operating in the European Union will be shut down by 2025.

While the decommissioning of nuclear installations is an exclusively national competence, the national decommissioning funds were discussed in the context of the Directive on the common rules for the internal market in electricity³⁷. The European Commission has expressed its intention to publish an annual report on the use of decommissioning and waste management funding schemes within the scope of its responsibilities under the Euratom Treaty.

The report³⁸ on the use of financial resources earmarked for the decommissioning of nuclear power plants covering the 14 EU Member States possessing nuclear power plants – both operational and shut-down - noted the diverse national approaches to financing decommissioning. While the existing schemes have generally functioned satisfactorily until now, the creation of the internal market has brought an increased need for transparency and harmonisation in the management of these financial resources. The report states a preference to the establishment of earmarked funds for decommissioning, intending that they will be available when needed and that they will only be used for the anticipated purposes. Furthermore, it also concluded that the methods of financing decommissioning should be harmonised in the Member States in due course. To that end, pending adoption by the Council of legally binding instruments in the field of nuclear safety and management of radioactive waste, the European Commission expressed its intention to present a recommendation in 2005.

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

³⁷ 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.

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.

radiation ... namely ... the ... processing, handling, ... storage ... and disposal of radioactive substances”³⁹.

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 the management of spent fuel at the intermediate storage facility for irradiated fuel at the site of the Gundremmingen II NPP (D) and at the intermediate storage facility for irradiated fuel at the site of the Philippsburg NPP (D). It has also given opinions on radioactive waste management at the following installations: radioactive waste conditioning and storage facility (CEDRA) at Cadarache (F), intermediate storage facility for low-active waste at Belgoprocess plc (B), building 131X (Pamela) at Belgoprocess plc (B) and the Aube storage centre (F).

9.3. Design and construction of facilities (*Articles 7 and 14 of the Joint Convention*)

Euratom's 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

³⁹ See section 6 “Euratom’s legislative and regulatory framework”.

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's 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 Community⁴⁰

Council Directive 92/3 Euratom lays down a standardised system of controls and authorisations for the transfrontier shipment of radioactive waste, from the point of origin to the destination.

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 to or through their country and that they approve of or have an opportunity to object to any such transfer.

As regards exports, the authorities of the non-Community country of destination are informed about the transfer. Export of radioactive waste to certain places is totally forbidden, e.g. to the Antarctic, to the parties to the Lomé Convention or to states which do not have the necessary resources to manage the waste safely.

Member States are required to report to the European Commission every two years on implementation of the Directive. On the basis of these reports the European Commission prepares summary reports for the EU Council, Parliament and the Economic and Social Committee. Three reports have been published on implementation of the Directive, the latest covering the period 1996-1998.

The process for adopting a new Directive to replace Directive 92/3/Euratom is in progress.

The new Directive proposed by the European Commission would also apply to shipments of spent fuel intended for reprocessing and would simplify the procedures, while ensuring consistency with the latest Euratom Directives and with Article 27 of the Joint Convention, in that the prior consent of the non-Community country of destination would be required before authorising shipments.

10.2. Euratom Regulation on shipments of radioactive substances between Member States⁴¹

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.

⁴⁰ Council Directive 92/3/Euratom of 3 February 1992 on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community, OJ L 35, 12.2.1992, p. 24.

⁴¹ Council Regulation (Euratom) No 1493/93, OJ L 148, 19.6.1993, p. 1.

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)⁴² or radioactive sources for:

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

These practices are exempted from or no longer submitted for authorisation/notification where the concentration values/quantities are below the exemption values set in the annex to the Directive. These provisions are supplemented by the Directive on the control of high-activity sealed radioactive sources and orphan sources⁴³, 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.

⁴² Between brackets because not suitable for terrorist acts.

⁴³ Directive 2003/122/Euratom, OJ L 346, 31.12.2003, p. 57.

- 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.

In order to facilitate the return of disused sealed sources to suppliers based in another country, Directive 92/3 expressly excludes such shipments from the administrative authorisation system (in the new Directive replacing Directive 92/3 this exclusion will be extended to shipments to the manufacturer or a recognised installation).

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 States⁴⁴ and certain non-member States⁴⁵. 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. To meet this requirement, four such reports were produced under the Plans of Action, the last in 1999⁴⁶.

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. A fifth situation report was published in 2003⁴⁷ and the sixth is currently being prepared. Although the EU has changed considerably since the report's inception, expanding from 9 to now 25 Member States, it has been possible to draw a number of conclusions, such as the significant decrease in the quantities of waste produced (1990 – 12 MS, 80 000 m³; 2000 – 15 MS, 34 000 m³) and the application of integrated management solutions through to disposal of all but the most hazardous long-lived and high-level wastes.

⁴⁴ 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.

⁴⁵ 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.

⁴⁶ COM(1998) 799 final, Communication and fourth report from the Commission on the present situation and prospects for radioactive waste management in the European Union.

⁴⁷ EUR 20653 EN, Fifth situation report - Radioactive waste management in the enlarged European Union, Webster S. (ed.), European Commission, Brussels, 2003.

12.3. Euratom Research Framework Programmes⁴⁸

The European Union makes a major contribution to the safety of radioactive waste management (RWM) through its research activities under the Treaty. The Treaty provides 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 Title II, Chapter 1, especially Article 7 which provides for establishing Community research and training programmes. These “Framework Programmes” (FP) and the 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 sixth Euratom Framework Programme⁴⁹ (FP6, 2002 – 2006). Priority areas of research are described at greater length in the accompanying SP⁵⁰. The European Commission is responsible for implementation of these programmes. Annual work programmes are drawn up by the European Commission, with the endorsement of the Programme Committee made up of representatives appointed by the EU Member States, and implemented via calls for proposals⁵¹ published in the Official Journal of the EU. The proposals submitted are evaluated by independent experts from various fields of research. Successful proposals are funded mainly by a shared-cost mechanism whereby an EU grant is given to the overall project budget, with the partners working on the project contributing the balance of the funding.

On 6 April 2005 the European Commission adopted its proposal for FP7⁵². The Euratom programme covers research in both fusion and fission (including radiation protection). The proposed budget for fission and radiation protection activities is €394 million over the period 2007–2011. Five main areas of activity have been identified: management of radioactive waste (geological disposal and P&T), reactor systems, radiation protection, research infrastructure, and human resources and training.

13. THE WAY AHEAD TO IMPROVE SAFETY THROUGHOUT THE EURATOM COMMUNITY (*SECTION K*)

The commitment of Euratom and its Member States to the safe management of spent fuel and radioactive waste is the result, in particular, of the existing Community legislative framework adopted under the Euratom Treaty.

Member States and the Commission have been urged to engage in a wide-ranging consultation process facilitating the choice of instruments on several occasions, in particular by the 2001 Laeken European Council and by the Council conclusions of 28 June 2004 on the safety of nuclear installations.

⁴⁸ For more information see Annex II.

⁴⁹ Council Decision 2002/668/Euratom, OJ L 232, 29.8.2002, p. 34.

⁵⁰ Council Decision 2002/837/Euratom, OJ L 297, 29.10.2002, p. 74. There is a separate SP for the nuclear research activities of the Commission’s Joint Research Centre (not considered in this report).

⁵¹ Details of all calls to date under FP6 can be found on <http://fp6.cordis.lu/fp6-euratom/calls.cfm>.

⁵² COM(2005) 119 available on: http://europa.eu.int/comm/research/future/index_en.cfm#.

With the new ICRP recommendations expected to be published by 2007, a new process has started for either amending the BSS Directive or adopting a completely new Directive which, while taking into consideration relevant work promoted at international level, would recast the existing Euratom legislation and consolidate, in particular, the Community principles regulating nuclear safety, radiation protection, the safety of radioactive waste management and the safe transport of radioactive material, as derived from the Euratom Treaty and the ensuing secondary legislation, including the International Conventions to which Euratom is a Contracting Party.

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 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 research effort required. The initial FPs concentrated on safety aspects and technical development of the second generation of nuclear power reactors, but now that this technology has reached industrial maturity the priority has naturally shifted 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 industrial maturity, and environmental and safety considerations mean that RWM is a topic of concern for a number of Member States and an area on which research efforts are being concentrated.

FP5 – Fifth Euratom Framework Programme

The vast majority of RWM research projects launched under FP5 (1998–2002) have now ended. Details of individual projects and summary reports are available either on the

Cordis website⁵³ or in EU publications⁵⁴. Major progress was achieved in the following areas: repository technology, performance assessment of repository systems, long-term behaviour of repository systems, quality checking of waste packages, management strategies, public attitudes and involvement, strategy studies, chemical separation (partitioning), transmutation and waste minimisation.

FP6 – Sixth Euratom Framework Programme

RWM is one of the thematic priority areas for research in FP6, covering both geological disposal of long-lived radioactive waste and partitioning and transmutation (P&T). In the case of geological disposal, research is needed to develop and test repository technologies, investigate suitable sites and promote basic scientific understanding relating to safety and safety assessment methods. However, technical research alone cannot ensure societal acceptance of geological disposal. Consequently, research is also being conducted on the “softer” sciences to develop decision-making processes that are perceived as fair and equitable by the stakeholders involved. Continued research is also needed to investigate P&T processes and techniques and their application on an industrial scale to reduce the long-term hazards associated with nuclear waste, as well as to explore the potential of new concepts of nuclear energy generation to make more efficient use of fissile material and to produce less waste.

A high degree of continuity has been maintained with activities under FP5, though FP6 has seen a considerable consolidation of research effort. The emphasis is on enhanced coordination of research activities and generally larger projects involving a greater number of partners. Closer cooperation between the key players contributing to the general EU policy aims of strengthening the European Research Area, less fragmentation of research effort and greater “added value” from EU-funded research activities are the expected outcomes. This strategy has been made possible by introducing new funding instruments such as Integrated Projects and Networks of Excellence (see Table 1). Education, training, dissemination and knowledge management in general are other essential ingredients of all projects. The larger size of projects in FP6 has meant a reduction in the number compared with FP5 (11 to date compared with approximately 50 previously) even though the budget allocated to RWM in FP6 is greater (approximately €90 million, of which around €63 million has already been allocated, compared with €60 million in FP5).

Table 1 summarises the current situation with implementation of FP6 in the field of RWM. Only the major projects are listed; several smaller coordination activities, specific support action and action facilitating transnational access to infrastructure facilities have also been launched. 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. Note that further RWM projects will be launched following the final call for proposals, for which the deadline was 11 October 2005⁵⁵. A major IP on performance assessment technologies is one of the possible projects which will be launched in 2006.

⁵³ <http://www.cordis.lu/fp5-euratom/src/projects.htm>.

⁵⁴ See in particular “*Geological disposal of radioactive wastes produced by nuclear power – from concept to implementation*” available at: http://europa.eu.int/comm/research/energy/pdf/waste_disposal_en.pdf.

⁵⁵ http://fp6.cordis.lu/fp6-euratom/call_details.cfm?CALL_ID=212.

FP7 – Seventh Euratom Framework Programme

On 6 April 2005 the European Commission adopted its proposal for FP7⁵⁶. As in the past, the Euratom programme covers research in both fusion and fission (including radiation protection). The proposed budget for fission and radiation protection is €394 million over the five years 2007–2011. Five main areas of activity are identified: management of radioactive waste (geological disposal and P&T), reactor systems, radiation protection, research infrastructure, and human resources and training. The accompanying proposal for the SP was adopted by the European Commission on 21 September 2005, and the first call for proposals is planned for early 2007. Note, however, that the EU Member States have yet to agree in the Council on the European Commission's proposal for the Seventh Euratom Framework Programme. This process, entailing discussion, possible revision and adoption, will take several months.

⁵⁶ COM(2005) 119 available on: http://europa.eu.int/comm/research/future/index_en.cfm#.

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

Project acronym and title ¹	Instrument ²	Coordinator	Number of partners ³	EU contribution/total cost	Start date & duration
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
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	IP	SCK.CEN (B)	40 (10)	€8M/ €16.8M	1/1/04 4 years
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
EUROPART European research programme for the partitioning of minor actinides and some long-lived fission products from high-active wastes from the reprocessing of spent nuclear fuels	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	IP	FZK-NUKLEAR (DE)	32	€23M/ €43M	1/4/05 4 years
RED-IMPACT Impact of Partitioning, Transmutation and Waste Reduction Technologies on Final Nuclear Waste Disposal	STREP	Kungliga Tekniska Högskolan (SE)	23 (10)	€2M/ €3.51M	1/3/04 3 years
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

¹ See <http://www.cordis.lu/fp6- Euratom/projects.htm> for fuller details.

² NoE = Network of Excellence; IP = Integrated Project; STREP = Specific Targeted Research Project (for details of instruments see <http://www.cordis.lu/fp6/instruments.htm>).

³ The figures in brackets indicate the number of European countries represented.