

# COMMISSION

## COMMISSION RECOMMENDATION of 15 September 1999 on a classification system for solid radioactive waste

(SEC(1999) 1302 final)

(1999/669/EC, Euratom)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community, and in particular Article 155 thereof, having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 124 thereof,

- (1) Whereas under Article 174 of the Treaty establishing the European Community calls for promoting measures at international level to preserve, protect and improve the quality of the environment;
- (2) Whereas Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment <sup>(1)</sup> requires under Article 7 that 'Member States shall take the necessary steps to provide general information to the public on the state of the environment by such means as the periodic publication of descriptive reports';
- (3) Whereas Council Resolution 92/C 158/02 of 15 June 1992 on the renewal of the Community plan of action in the field of radioactive waste <sup>(2)</sup> under point 1 'Continuous analysis of the situation' of the Annex, requires that the Commission will periodically provide the Council with an analysis of the situation and prospects in the field of radioactive waste management in the Member States, with special reference to safety and environmental protection requirements and the requirements of nuclear programmes and activities involving radioisotopes. The Commission will also keep the European Parliament informed of this analysis;
- (4) Whereas the Community action plan in the field of radioactive waste <sup>(2)</sup> calls for, 'Concerted action on the safe management of radioactive waste' which should make it possible to 'approximate national practices and regulations in the field of safety of disposal, with particular reference to the different waste categories';
- (5) Whereas the Committee of the Regions under Article 11 of Resolution 98/C 251/06 on nuclear safety and local/regional democracy <sup>(3)</sup> 'considers that many of the issues relating to the consideration of proposals for disposal of radioactive waste are complex and not subject to widespread public understanding and for this reason believes that it is crucial to ensure access to all relevant information to the public, to involve local and regional authorities, and the public in decision-making and to seek public confidence in the principles that govern the safety of repositories and in waste management programmes';

HEREBY RECOMMENDS:

on the base of the explanatory statements provided in the Annex;

that the Member States and their nuclear industry adopt a common classification system of radioactive waste for national and international communication purposes as well as to facilitate information management in this field;

that this classification system should be used for providing information concerning solid radioactive waste to the public, the national and international institutions and the non-governmental organisations. It would not replace technical criteria where required for specific safety considerations such as licensing of facilities or other operations;

<sup>(1)</sup> OJ L 158, 23.6.1990, p. 56.

<sup>(2)</sup> OJ C 158, 25.6.1992, p. 3.

<sup>(3)</sup> OJ C 251, 10.8.1998, p. 34.

that this classification system could be used by Member States. During the period to 1 January 2002 it could be used in parallel with existing national systems;

the proposed classification is summarised as follows:

1. **Transition radioactive waste**

Type of radioactive waste (mainly from medical origin) which will decay within the period of temporary storage and may then be suitable for management outside of the regulatory control system subject to compliance with clearance levels.

2. **Low and intermediate level waste (LILW)**

In LILW the concentration of radionuclides is such that generation of thermal power during its disposal is sufficiently low. These acceptable thermal power values are site-specific following safety assessments.

2.1. *Short-lived waste (LILW-SL)*

This category includes radioactive waste with nuclides half-life less than or equal to those of Cs137 and Sr90 (around 30 years) with a restricted alpha long-lived radionuclide concentration (limitation of long-lived alpha emitting radio-nuclides to 4 000 Bq/g in individual waste packages and to an overall average of 400 Bq/g in the total waste volume).

2.2. *Long-lived waste (LILW-LL)*

Long-lived radionuclides and alpha emitters whose concentration exceeds the limits for short-lived waste.

3. **High level waste**

Waste with such a concentration of radionuclides that generation of thermal power shall be considered during its storage and disposal (The thermal power generation level is site-specific and this waste is mainly forthcoming from treatment/conditioning of spent nuclear fuel).

This Recommendation is addressed to the Member States.

Done at Brussels, 15 September 1999.

*For the Commission*

Ritt BJERREGAARD

*Member of the Commission*

## ANNEX

**1. Introduction**

Radioactive waste comprises a great variety of materials, with different physical, chemical and radioactive characteristics. This diversity results in widely different potential hazards.

The classification systems for radioactive waste in use across the European Union vary widely in approach and application. Some are used purely for communication purposes, while others are dictated by the disposal route.

Member States' radioactive waste classification systems are based on activity concentration, total activity, waste source or disposal route.

One of the main differences is between countries which have nuclear power generation and those that do not. In addition the borderlines between the categories are not always easily quantifiable and hence can vary widely from one country to another.

Differences in radioactive waste classifications may make cooperation between Member States difficult within the framework of the single market and the free movement of goods and services. For instance in the optimisation of disposal facilities and in return of wastes following treatment and/or conditioning, a common language defining the different radioactive waste categories could be very useful.

A European Union classification system should also be useful for providing comparative information concerning solid radioactive waste to the public, the national and international institutions and the non-governmental organisations.

This explanatory statement outlines the reasons and need for harmonisation, discusses the requirements and describes the proposed classification system.

**2. Background**

The Community action plan in the field of radioactive waste <sup>(1)</sup> calls for 'concerted action on the safe management of radioactive waste' which should make it possible:

1. develop a common approach and work towards harmonisation at Community level on radioactive waste management strategies and practices wherever possible,
2. approximate national practices and regulations in the field of safety of disposal, with particular reference to the different waste categories,
3. draw up recommendations regarding safety assessment in the storage of radioactive waste and establish the relevant criteria,
4. to achieve, generally speaking, an equivalent and satisfactory degree of protection at the highest practical safety level for workers, members of the public and the environment.

In general terms, as a consequence of industrial, research and medical activities, residual materials containing radio-nuclides are produced. Following potential segregation, reuse in the nuclear industry and treatment, there are, in principle, two categories of such materials left. The main distinction between the two categories is established as follows:

category 1: those materials that can be managed outside of the regulatory control system;

category 2: those residual materials for which no further use is foreseen and which need specific management procedures according to their radioactive properties.

Material of category 1 can be released by national authorities provided they comply with clearance levels established using the basic criteria laid down in Annex 1 of Directive 96/29/Euratom <sup>(2)</sup>. National authorities shall take into account technical guidance provided by the Community. It should be noted however that there is as yet no common basis for the harmonisation of category 1.

<sup>(1)</sup> Council Resolution of 15 June 1992 on the renewal of the Community plan of action in the field of radioactive waste (OJ C 158, 25.6.1992, p. 2).

<sup>(2)</sup> Council Directive Euratom 96/29 of 13 May 1996 laying down basic safety standards for the health protection of the general public and workers against the danger of ionising radiation (OJ L 159, of 29.6.1996, p. 1).

Only category 2 materials are regarded as 'radioactive waste', and this recommendation is only concerned with the latter. Two basic management alternatives can be defined:

1. storage for a limited period of time until they can be either assigned to category 1 or disposed;
2. disposal following well-established routes (surface or near-surface disposal, or deep disposal).

In general, the factors considered most relevant to the definition of radioactive waste classification systems as well as management procedures are: type of radionuclides, total activity, activity concentration, half-life, dose rate, heat generation and other physical/chemical properties.

International bodies, national authorities and waste operators have established radioactive waste classification systems in their sectors of competence or responsibility (waste treatment, transport, waste disposal, communication within international scientific community and with the public, etc.), grouping in the same category wastes with similar characteristics and hazards, with a view to facilitate management and thereby improve safety.

Most national needs of the Member States are adequately covered by the national classifications they have developed (see Section 4, 'Current position'). However, since these systems have been developed independently and for different purposes, they can vary significantly, some being based on activity concentration, others on source or disposal route.

The use by all countries of the international IAEA classification of radioactive waste packages is a suitable base to develop a common classification system for the Member States of the European Union. Definition of a reference classification system may provide useful guidance for specific countries in developing their own management strategies, whilst at the same time facilitating general and commercial communications. Concerning safety, however, while such a reference classification system may be useful for generic and basic considerations, it cannot replace specific safety assessments performed for specific management purposes, including the selection of disposal routes.

### **3. The purpose of a European Union waste classification system.**

A classification system's primary purpose is to improve communication and facilitate information management by providing a good descriptive tool enabling holdings of radioactive waste within the Community to be described to politicians and the public in a standard and easily understood manner.

A more difficult issue is the relationship between the classification system and the way in which waste itself is handled and eventually disposed of in practice. Therefore the Commission services shared the view that the classification system should be indicative (qualitative) rather than prescriptive.

The key consideration is that any such qualitative classification system could never pre-empt the role of national regulatory authorities in the control of handling and disposal of radioactive waste at specific sites. The detailed safety assessments which they employ in light of their own specific management and regulatory arrangements and capabilities require much more detailed information concerning the individual waste streams than a classification system can provide. The different current waste classification systems used in practice within the Member States rarely feature in the wording of national legislation or regulatory procedures.

The divergence of current plans for final radioactive waste disposal within individual Member States also complicates the linkage of waste classification to eventual disposal routes. Some Member States have firm plans for both deep and surface disposal facilities for different types of waste. Other are likely to opt for only one of these types of facility, and some are undecided.

Some Member States believe that a suitably constructed classification system could provide basic guidance as to how radioactive waste management, in particular disposal, could be better structured in general terms. For example in those Member States where both surface and deep underground disposal options were available it might give some indication of the groups of waste streams which would go to each type of disposal site.

In light of the current diversity of national waste classification systems, a European Community classification system could be used initially in parallel with existing national systems until 1 January 2002. It would also need to be capable of dealing with all current and anticipated future waste streams in order to allow comprehensive reporting of holdings. It will serve regulatory purposes and improve communication to the public, for example on free access to environmental information (Directive 90/313/EEC).

#### 4. Current position

The classification systems used in the Member States and the central and east European countries who have applied for membership of the EU have been described by the EU (1). This EC report gives extensive information on the individual countries classification systems.

The classification systems can be briefly described as follows.

##### 4.1. EU Member States

###### **Belgium**

Radioactive waste is classified separately in Belgium according to whether it is unconditioned or conditioned. The categorisation of unconditioned waste depends on the physical state, the nature of the emitters, the level of activity concentration and the applicable treatment. These characteristics are summarised by a three position alphanumeric. Conditioned waste is defined according to the disposal route and split into three categories, A, B and C. The classification is based on suitability for surface or deep disposal and on the heat generating capacity of the conditioned waste. An additional type of waste is currently being considered, this is radium contaminated waste. No other changes to the classification system are expected.

###### **Denmark**

Disposal of radioactive waste has not been considered in Denmark to date, hence only storage is taken into account in the classification system. The system is based mainly on the origin of the waste and to some extent on measurement and sorting. On arrival at the storage facility the waste is classified according to external radiation, after treatment the waste units are stored in either the low level waste or low intermediate level waste storage facility according to dose rate and fissile content. Spent sealed sources are stored at Risoe National Laboratory. No revisions are expected to the classification system.

###### **Finland**

Radioactive waste is firstly classified into two main types of waste, radioisotope waste and nuclear waste. Radioisotope waste comes from hospitals, research institutes and industry, whereas nuclear waste results from nuclear power plants and from a research reactor. Radioisotope waste is further classified according to its activity concentration into cleared waste or laboratory waste. Nuclear waste is split into three categories according to its origin and intended disposal route, high level spent fuel, low and intermediate level waste from NPP operation and low and intermediate level waste from decommissioning NPPs. The low and intermediate level waste is then classified further into cleared waste, low level waste and intermediate level waste according to activity concentration. No changes to the classification system are expected.

###### **France**

In the nuclear industry, waste is divided between conventional waste and nuclear waste according to its geographical and functional origin (zoning of the installations). For nuclear waste the classification system is a matrix linking the toxicity of the waste to the disposal routes. Two parameters are distinguished for defining the toxicity of the waste: lifetime of the main radionuclides (under or over 30 years) and activity content (very low, low, intermediate and high). On this basis the classification system presents eight categories of waste, each linked to one or more management pathways. Some of the pathways are still under study.

###### **Germany**

The radioactive waste classification system for Germany is related to the disposal site. Classifications are established by the operator as a result of site specific safety assessments taking into account the legally binding acts, ordinances and regulations. Quantitative requirements are then set for the specific repository particularly including a system of waste form groups, waste container classes and radio-nuclide specific activity limitations. No basic changes to the classification system are expected.

###### **Greece**

There is no official classification system for radioactive waste in Greece, as the only radioactive waste produced is from research institutes, hospitals and industry. However, users must have a license, issued by the Regulatory Authorities, if they wish to perform activities that generate radioactive waste.

The radio-protection regulation is currently undergoing modification which could have an effect on the classification system.

###### **Ireland**

As there are no nuclear power plants or fuel-cycle facilities in Ireland radioactive waste is classified simply by half life and then according to whether it is a sealed or unsealed source. No modifications to the existing system are foreseen.

(1) Radioactive waste categories. Current Position (98) in the EU Member States and in the Baltic and central European countries. 1998 EUR-OP Luxembourg EUR 18324.

**Italy**

The basis of the classification system for conditioned waste in Italy is the disposal route. Radioactive waste is classified into three categories, according to the radio-isotopic characteristics and activity concentrations. Category I waste is that which decays in a few months to below clearance levels, the remaining waste is classified according to half-life and activity content into Category II and III. Category II is further divided into two subcategories dependent on their conditioning requirements prior to final disposal.

The only changes envisaged are to 'Technical guide No 26' which will be revised to incorporate technical requirements for HLW, vitrified waste and ILW (non-heat generating).

**Netherlands**

No decision has been taken as yet on the disposal route for radioactive waste therefore the classification system concentrates on the treatment and conditioning of radioactive waste without foreclosing on any disposal option. There are three categories of radioactive waste, each of which has a number of sub-categories. Category 1 includes all low and intermediate level waste below a set dose rate and is subdivided according to the origin, radionuclide content and half-life. Categories 2 and 3 waste are classified depending on heat production and then subdivided according to origin and type of waste respectively. No modifications to the existing system are foreseen.

**Portugal**

The classification of radioactive waste is defined according to disposal route. There are three categories, short-lived low level waste (from research, medicine and industry, also includes beta/gamma spent sealed sources with half-life less than 30 years, conditioned via separate routes), Alpha waste (mainly radium and americium spent sealed sources) and uranium mining and milling waste. No modifications to the existing system are foreseen.

**Spain**

The Spanish classification system has two waste categories based on the disposal option planned or applied to them, these are low and intermediate level waste which is suitable for near surface disposal and all other waste. In addition to this, specific criteria are set for individual disposal sites; these are requirements relating to the properties of the waste package, the conditioning, and specific radio-nuclides as well as for the site as a whole.

No modifications to the existing system are foreseen, although clarification may be needed in the wording used to describe the management of spent fuel, currently HLW, as a result of the recent Vienna Conventions on the safe management of spent fuel.

**Sweden**

Radioactive waste is divided into nuclear and non-nuclear waste, for example waste arising from hospitals and research institutions. Some low level nuclear waste is disposed of in shallow surface repositories, according to criteria on activity concentration and total activity. Nuclear waste which is not cleared or disposed of in shallow surface repositories is classed into three disposal routes. These are rock repository for operational waste (operational), rock repository for decommissioning waste (planned) and a repository for spent fuel and other long lived wastes (planned). Non-nuclear waste which cannot be cleared is conditioned and then disposed of with nuclear waste, or stored awaiting construction of planned facilities. No changes to the classification system are expected.

**United Kingdom**

The United Kingdom has four broad categories of radioactive waste, classified according to the heat generating capacity and the activity content of the waste. The four categories are very low level waste, low level waste, intermediate level waste and high level waste.

A 1995 policy review indicated that there was a possible need for revisions to the waste classification system in light of EU deliberations. Any change to the system could be phased in with implementation of the new Euratom basic safety standards.

**4.2. Central and east European Countries****Bulgaria**

Bulgaria has three categories of radioactive waste classified according to the equivalent dose rate of gamma emission at a distance of 0,1 m from the surface or the value of specific alpha or beta activity. Institutional waste and spent sealed sources are classified under the scheme above.

**Czech Republic**

The Czech Republic does not have a classification system which is specified in the regulations. However the regulations require waste generators to establish their own classification system, according to their system of treatment and conditioning and the technology used and with respect to criteria set by the State Office for Nuclear Safety. For national communication purposes the categories low and intermediate level waste, high level waste and spent fuel are used, although these are not defined.

**Estonia**

Estonia is in the process of changing the radioactive waste classification system and the new regulation is expected to be in place by the end of 1998. Until that time Estonia continues to use the old USSR classification system (SPORO-85). SPORO-85 sets clearance limits for radioactive waste based on specific activity and surface contamination. Radioactive waste is then divided into three groups, items, biological waste and spent radiation sources. These groups are then subdivided into three groups according to dose rate.

**Hungary**

Hungary's waste categorisation system is based on the source of the waste and activity concentration. The three categories are low level waste, intermediate level waste and high level waste, depending on the activity concentration or the surface dose rate of the radioactive waste.

**Latvia**

The Latvian authorities are in the process of drafting new regulations on radioactive waste management. The new system will be based on disposal routes with waste categorised according to half-life and activity content. Existing waste can be put into three categories, waste disposed of in old vaults, waste stored in new vaults and spent sealed sources held in interim storage.

**Poland**

In Poland limits are given for establishing whether waste is considered to be radioactive waste or not, once this has been established the radioactive waste is classified according to radio-nuclide content (beta/gamma or alpha) and closed radiation sources. Beta/gamma waste is then further grouped into low, intermediate and high level waste according to activity concentration. Additional criteria are given for individual packages for storage and disposal.

**Romania**

Radioactive waste is placed in three categories, high, intermediate and low level waste in Romania according to the specific activity or the surface dose rate. Solid low level waste is then further categorised into combustible, non-combustible or special waste. Combustible waste is sub-categorised into biodegradable and non-biodegradable and non-combustible waste according to whether it can be compacted or not. Uranium mining and milling waste is classified separately according to its physical characteristics and activity concentration. The current radioactive waste management system is to be reviewed in the near future and a classification system based on the IAEA system and EC recommendations is envisaged.

**Slovak Republic**

There is no formal classification system as yet in the Slovak Republic. A qualitative system is widely used which has low, intermediate and high level waste categories, however there are no specific limits for the categories. The current system is based mainly on the source of the radioactive waste but a revision of the system is under way and the new system is likely to be based on the disposal route.

**Slovenia**

Slovenia has three categories of radioactive waste: low level waste, intermediate level waste and high level waste. These are based on the source of the waste with limits set on the specific activity. The categories of low and intermediate level waste are subdivided into waste with alpha emitters and those with beta/gamma emitters. There is work ongoing on a classification system based on the IAEA system with the inclusion of the exemption approach.

## 5. Commission's proposed classification system

Radioactive waste management systems should be established according to the characteristics and properties of the waste, and its potential to cause harm to humans and/or impact on the environment. Acceptance criteria for radioactive waste in a disposal facility are derived from (and supported by) safety assessments that have to consider the specific conditions relevant to the case (regulatory requirements, repository concept, assessment context, etc.). These conditions are even more important when trying to define acceptance criteria for near-surface facilities. They include the disposal concept, the type and role of engineered and natural barriers, the type and period of institutional control assumed to exist, and the scenarios to be considered in the assessments.

Any radioactive waste classification system based on disposal, for general use, can only be qualitative (indicative), unless important features of the safety assessment can be fixed in advance with a great degree of realism and credibility.

Such an indicative system provides a qualitative description of the individual waste categories. In this case, most of the general characteristics of the radioactive waste are used as criteria for the classification. Nevertheless numerical values to characterise broad bands or 'orders of magnitude' for some key properties are also helpful.

The European Commission classification system is based on the IAEA classification scheme <sup>(1)</sup> with some changes to take into account the views and practical experiences of European national experts. For instance the IAEA recommended limit of heat generation in LILW radioactive waste (2 kW/m<sup>3</sup>), was not retained. The experts could not find any foundation for such a value and commonly accepted that this value is only related to site-specific safety analysis. This classification system deals only with materials which contain or are contaminated by radionuclides and for which no further use is foreseen (Council Directive 92/3/Euratom <sup>(2)</sup>).

The classification scheme is intended for use with solid waste only, however it should be noted that some liquid waste could be covered by the proposed transition waste category (mainly hospital and medical radioactive waste).

The classification system could be used initially in parallel with national systems until 1 January 2002. National technical classification criteria should not be replaced as they are based on specific safety considerations such as licensing of facilities or other operations. It should be noted that no simple classification scheme can address all the issues associated with its use, these would need to be dealt with in separate, more detailed, guidance. However, it should be made clear that a well described and supported, but basically qualitative waste classification scheme still provides a lot of useful information to facilitate information management on radioactive waste and improve communication actions at European level. The following paragraphs describe the proposed classification system based on radioactivity content, duration and thermal power generated.

### 5.1. Transition radioactive waste

Type of radioactive waste (mainly from medical origin) which will decay within the period of temporary storage and may then be suitable for management outside of the regulatory control system subject to compliance with clearance levels. It is suggested to use five years as the maximum duration, beyond this period of five years the waste should be regarded as low and intermediate level waste. The clearance levels are values established by national competent authorities and expressed in terms of activity concentration and/or activity, at or below which radioactive substances or materials containing radioactive substances arising from any practice subject, to the requirement of reporting or authorisation may be released from the requirements of Directive 96/29 Euratom. These levels shall follow the basic criteria used in Annex 1 to the Euratom basic safety standards to Council Directive 96/29/Euratom and shall take into account any other technical guidance provided by the European Community.

### 5.2. Low and intermediate level waste (LILW)

In LILW the concentration of radionuclides is such that generation of thermal power during its disposal is sufficiently low. These acceptable thermal power values are site-specific following safety assessments.

#### 5.2.1. Short-lived waste (LILW-SL)

This category includes radioactive waste with nuclides within half-life less than or equal to those of Cs137 and Sr90 (around 30 years) with a restricted alpha long-lived radionuclide concentration (limitation of long-lived alpha emitting radionuclides to 4000 Bq/g in individual waste packages and to an overall average of 400 Bq/g in the total waste volume).

#### 5.2.2. Long-lived waste (LILW-LL)

Long-lived radionuclides and alpha emitters whose concentration exceeds the limits for short-lived waste.

<sup>(1)</sup> IAEA Safety Series No 111-G-1.1 Classification of radioactive waste, A safety guide. Vienna 1994.

<sup>(2)</sup> OJ L 35, 12.2.1992, p. 24.

### 5.3. *High level waste*

Waste with such a concentration of radionuclides that generation of thermal power shall be considered during its storage and disposal (The thermal power generation level is site-specific and this waste is mainly forthcoming from treatment/conditioning of spent nuclear fuel).

## 6. **Conclusions**

The Commission recommends the Member States and their industry to adopt the proposed classification system for national and international communication purposes.

This classification system should be used for providing information concerning solid radioactive waste to the public, the national and international institutions and the non-governmental organisations.

The Commission recommends the use of this classification system by Member States. During the period to 1 January 2002 it could be used in parallel with existing national systems.

Therefore it seems useful that the Commission addresses a recommendation to the Member States for a classification system for solid radioactive waste.

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