CHAPTER 10

THE PRINCIPLES OF RADIOACTIVE WASTE MANAGEMENT

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CLASSIFICATION OF RADIOACTIVE WASTE
1. INTRODUCTION

BACKGROUND
There are a number of alternatives for safe disposal of Radioactive wastes, ranging from geological disposal to near surface disposal and direct discharge to the environment.

To simplify their management, a number of schemes have evolved for classifying radioactive waste according to the physical, chemical and radiological properties . . .

These schemes have led to a variety of terminologies differing from country to country and even between facilities in the same country.
1. INTRODUCTION

BACKGROUND
This situation makes it difficult for those concerned to communicate with one another regarding waste management practices.
causes problems in comparing data published in the scientific literature.
causes confusion among members of the public trying to understand waste management programmes and practices of their country and of other Member States.

IAEA references on radioactive waste classification systems given in IAEA Technical Reports.

OBJECTIVE

• to recommend a method of deriving a classification system and to suggest a general system for classifying radioactive waste that will facilitate communication and information exchange among Member States, and eliminate some of the ambiguity that now exists in classification schemes for radioactive waste.

• to specify boundaries in a general system for classifying radioactive waste, especially in the assignment of boundaries to radioactive waste classes. It describes how to deal with a classification system, points out approaches for further quantification of classes by setting limits for individual radionuclides and discusses methods by which boundaries can be derived.
2. APPROACHES TO RADIOACTIVE WASTE CLASSIFICATION

PURPOSE OF CLASSIFICATION

- when the quantity of elements considered (objects or ideas) is large, to ease management of the elements by reducing their number
- Classification is realized by selecting the main features (criteria) and by structuring these criteria.
- Classification may be more or less precise depending on the number of classes and the criteria considered
- The degree of differentiation depends on the purpose of the classification. It is essential, however, that:

PURPOSE OF CLASSIFICATION

- the definition of the classes and the derivation of the corresponding levels are clear and easily understood and developed on a sound technical basis;
- the restrictions of the applicability of the classification system are clearly known; and
- the number of classes is balanced between the desired differentiation and the ease of handling of the classification system.
PURPOSE OF CLASSIFICATION

It will help:

☑ at the conceptual level
  • in devising waste management strategies;
  • in planning and designing waste management facilities;
  • in designating radioactive waste to a particular conditioning technique or disposal facility;

☑ at the operational level
  • defining operational activities and in organizing the work with waste;
  • giving a broad indication of the potential hazards involved with the various types of radioactive waste;
  • by facilitating record keeping;

☑ for communication
  • providing words or acronyms universally understood which improve communication among experts from different countries, and between experts, generators and managers of radioactive waste, regulators and the public.

PURPOSE OF CLASSIFICATION

To satisfy these purposes

an ideal radioactive waste classification system should meet a number of objectives, including the following:

☑ cover the full range of radioactive waste types;
☑ address all stages of radioactive waste management;
☑ relate radioactive waste classes to the associated potential hazard;
☑ be flexible to serve specific needs;
☑ change already accepted terminology as little as possible;
☑ be simple and easy to understand; and
☑ be as universally applicable as possible.
3. PROPOSAL FOR A RADIOACTIVE WASTE CLASSIFICATION SYSTEM

**High level waste,**

(i) The highly radioactive liquid, containing mainly fission products, as well as some actinides, which is separated during chemical reprocessing of irradiated fuel (aqueous waste from the first solvent extraction cycle and those waste streams combined with it),

(ii) Any other waste with radioactivity levels intense enough to generate significant quantities of heat by the radioactive decay process,

(iii) Spent reactor fuel, if it is declared a waste.
**Intermediate level waste (medium level waste).**

Waste which, because of its radionuclide content requires shielding but needs little or no provision for heat dissipation during its handling and transportation.

**Low level waste.**

Waste which, because of its low radionuclide content, does not require shielding during normal handling and transportation.

**Exempt waste (EW)**

Exempt waste (EW) contains so little radioactive material that it cannot be considered 'radioactive' and might be exempted from nuclear regulatory control.

limiting annual doses to members of the public to 0.01 mSv

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<table>
<thead>
<tr>
<th>Waste classes</th>
<th>Typical characteristics</th>
<th>Disposal options</th>
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<tbody>
<tr>
<td>1. Exempt waste (EW)</td>
<td>Activity levels at or below clearance levels given in Ref. [4], which are based on an annual dose to members of the public of less than 0.01 mSv</td>
<td>No radiological restrictions</td>
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<tr>
<td>2. Low and intermediate level waste (LILW)</td>
<td>Activity levels above clearance levels given in Ref. [4] and thermal power below about 32 W/m²</td>
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<tr>
<td>2.1. Short lived waste (LILW-SL)</td>
<td>Restricted long lived radionuclide concentrations (limitation of long lived alpha emitting radionuclides to 4000 Bq/g in individual waste packages and to an overall average of 400 Bq/g per waste package); see paragraphs 324 and 325</td>
<td>Near surface or geological disposal facility</td>
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<tr>
<td>2.2. Long lived waste (LILW-L)</td>
<td>Long lived radionuclide concentrations exceeding limitations for short lived waste</td>
<td>Geological disposal facility</td>
</tr>
<tr>
<td>3. High level waste (HLW)</td>
<td>Thermal power above about 2 kW/m² and long lived radionuclide concentrations exceeding limitations for short lived waste</td>
<td>Geological disposal facility</td>
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FIG. 2. Decision chart for segregation of radioactive and exempt waste.