3. International Concept of Clearance in RWM

3.1 ICRP

The followings show the standpoint of ICRP on the use of the term “clearance”. These are derived from a reference document for a draft of ICRP future publication.

The concept of exemption has been in international use for some years. It was recommended by the ICRP in its main recommendations in Publication 60 and, in its Publication 64, the Commission provided guidance for exempting certain practices and their sources from some regulations.

The concept of exemption is used to determine a priori whether to regulate a specific practice. But, conceivably, the concept can also be used a posteriori, i.e. to consider the exemption from within the system. The BSS use the term “clearance” to describe the process of exemption from within, i.e., a posteriori exemption of sources that for one reason or another are under regulatory control and do not warrant continued regulation. Thus, clearance is defined in international standards as: “removal of radioactive materials or radioactive objects within authorized practices from any further control by the Regulatory Authority”.

The Commission has not used the term” clearance” in its recommendations, inter alia because the term has caused so much confusion. However, because of the overlap between the concepts of “exempt sources” and cleared sources”, and the resulting possibility of further confusion and imprecision, the Commission does not intend to recommend unilaterally the discontinuation of the use of the term “clearance”, as this recommendation will be insufficient to solve the problems with the terms. It will be unreasonable to expect the word clearance to disappear from usage, because it is too entrenched in professional parlance. The Commission also realizes that it is impossible to prevent colloquial use of a term, especially when it has gained a foothold - as in the case of “clearance”, However, the Commission notes that it may be necessary to develop separate and distinct definition of these concepts. It thus notes the regulatory problems caused by the equivocal use of the terms clearance and strongly recommends that its imprecise use be discouraged. This can be done by refining the definitions used in regulatory and legal instruments, for instance reaffirming that exemption of a practice or a source refers to the waiving of requirements within the scope of regulatory control, whereas clearance of materials refers to relinquishing all regulatory control of those materials, in the sense of terminating any requirements that applied to the person previously responsible for them. Any other associated meanings for clearance should be subsumed within the concept of exemption from within in its sense of relinquishing control.

The discussion above reinforces the Commission's conviction that it is not appropriate to define a "conditional clearance" – another unfortunate concept that has been used elsewhere. There is either clearance proper, where criteria for relinquishing control must be met in the understanding that there cannot subsequent restrictions, or authorized release of radioactive materials into the environment, where regulations might be applied to the method of release, the monitoring on its effects on the environment, etc.; but conditional clearance, requiring conditions to be met following release, is unfeasible.

3.2 IAEA

The followings show the standpoint of IAEA on the use of the term "clearance". These are derived from a reference document for Safety Guide of IAEA SAFETY STANDARDS SERIES No. RS-G-1.7. 'Clearance' means the removal of radioactive materials or radioactive objects within authorized practices from any further regulatory control by the regulatory body. Removal from control in this context refers to control applied for radiation protection purposes.

The BSS establish the requirements for protection against the risks associated with radiation exposure. The BSS cover both practices and interventions and present the concepts of exclusion, exemption and clearance. These concepts and the relations between them are briefly described here. While exemption is used as part of a process to determine the nature and extent of application of the system of regulatory control, clearance is intended to establish which material under regulatory control can be removed from this control. As with exemption, a clearance may be granted by the regulatory body for the release of material from a practice. Clearance is defined as the removal of radioactive materials or radioactive objects within authorized practices from any further regulatory control by the regulatory body. Furthermore, the BSS state that clearance levels "shall take account of the exemption criteria specified in Schedule I and shall not be higher than the exemption levels specified in Schedule I or defined by the regulatory body".

The activity concentration values developed for use in making decisions on the exemption of bulk materials may find use by regulatory bodies as a basis for the clearance of such materials. Two different approaches were employed to establish the values of activity concentration provided in this publication for use in making decisions on exclusion, exemption or clearance. The first approach applies the concept of exclusion to derive values of activity concentration suitable for radionuclides of natural origin. The second makes use of the concept of exemption in order to derive values of activity concentration for radionuclides of artificial origin. This strategy is a simplification of, but is consistent with, the approach described in the BSS, and it facilitates the development of a single set of values of activity

concentration covering all radionuclides. A full discussion of the methods used is given in the supporting Safety Report.

The primary radiological basis for establishing values of activity concentration for the exemption of bulk amounts of material and for clearance is that the effective doses to individuals should be of the order of 10 μSv or less in a year. To take account of the occurrence of low probability events leading to higher radiation exposures, an additional criterion was used, namely, the effective doses due to such low probability events should not exceed 1 mSv in a year. In this case, consideration was also given to doses to the skin; an equivalent dose criterion of 50 mSv in a year to the skin was used for this purpose.

The second radiological criterion for exemption set out in Schedule I of the BSS concerns the collective effective doses associated with a practice. The collective effective doses likely to be associated with the exemption and clearance of materials have been evaluated in a number of studies. It has generally been concluded that the individual dose criterion will almost always be limiting and that the collective effective dose commitments from one year of the practice will usually be well below 1 man Sv.

Many studies undertaken at the national and international levels have derived radionuclide specific levels for the exemption and clearance of solid material. The values of activity concentration presented in this Safety Guide draw on the extensive experience gained in undertaking these studies and on independent calculations performed under the auspices of the IAEA. The calculations are based on the evaluation of a selected set of typical exposure scenarios for all material, encompassing external irradiation, dust inhalation and ingestion (direct and indirect). The values selected were the lowest values obtained from the scenarios. Foodstuff and drinking water pathways of intake were taken into account to consider the radiological consequences as appropriate, but values for exempting these items have not been developed in this Safety Guide.

For a number of short lived radionuclides, the calculations lead to levels that are higher than the exemption levels given in the BSS. This is due to the fact that the scenarios used to develop the values relate to the transport, trade, use or deposition of materials outside the facilities in which they arise (e.g. reactors, accelerators and laboratories), and account was taken of the lapse of time there would be before the beginning of the exposure. In the models on which the exemption levels are based, the direct handling of the material within these facilities is considered, and consequently they do not allow for any radioactive decay of the radionuclides before the exposure begins. For these radionuclides, the values chosen were the exemption levels of Schedule I of the BSS.

The objective of this Safety Guide is to provide guidance to national authorities, including regulatory bodies, and operating organizations on the application of the concepts of exclusion, exemption and clearance as established in the BSS. The Safety Guide includes specific values of activity concentration for both radionuclides of natural origin and those of artificial origin that may be used for bulk amounts of material for the purpose of applying exclusion or exemption. In summary, the BSS provide radiological criteria to serve as a basis for the derivation of clearance levels but provide no definitive quantitative guidance on clearance levels.

3.3 European Commission

The European Commission (EC) recommended the clearance levels sorted for α nuclides and ß/γ nuclides in terms of recycling intending to generic standards within the Member States of the European Union (EU) in 1988. The concepts of Exemption and Clearance for practices are laid down in Title III of Council Directive 96/29/EURATOM of 13 May 1996, establishing basic safety standards (BSS) for the protection of the health of workers and the general public against the dangers arising from ionizing radiation in all EU Member States.

Since there are probabilities of circulations of reused materials within the region of EU Member States due to implementation of exemption from regulatory control, in 1998, the EC carried out unified reviews of the concept of exemption and clearance and then has published European guidance RP 89 (Radiation Protection No. 89), which is intended to recycling or reuse of equipment, especially metals, from dismantling of nuclear installations, reevaluating the document recommended in 1988. The attitudes of introduction of clearance levels for recycling or reuse of metals are described in RP 101 for surface density [Bq cm^{-2}] and in RP 117 for mass density [Bq g^{-1}]. In addition, a guidance RP 113 intended to concrete materials etc. which are arisen from buildings and building rubble when the dismantling of nuclear installations has been published in 2000 referencing RP 43 about criteria for recycling of materials. The technical basis for the establishment of clearance levels for buildings and building rubble arising from the dismantling of nuclear installations has been given in RP 114 including an overview of the exposure scenarios for the different considered release options, the resulting individual and collective doses and the corresponding clearance levels.

The dismantling of nuclear installations is probably the most important area of application of the concept of clearance, at least in terms of the volume of materials with a potential for clearance, but the concept may also be used for a broad range of other practices. Hence the need arose for default values for any type of material and for any pathway of release. These have been labeled general clearance levels, and the Article 31 Group of Experts recommends a set of nuclide specific values in a document RP 122 Part I published in 2000.

Application of the concept of exemption and clearance to natural radiation sources have also been published in Part II of the RP 122. For “Work Activity” introduced by the directive as the third category further to “Practice” and “Intervention”, the Part II of the RP 122 suggests that a dose increment, in addition to background exposure from natural radiation sources, of the order of 300 μSv is appropriate because it is not meaningful to define the levels on the basis of the individual dose criterion for practices (10 μSv per year)

EU Commission guidance documents and technical reports relevant to clearance and exemption described above are shown in Figure 1 and the recommended values of clearance level for major radionuclides are listed in Table 1.

In addition, RP 134 published in 2003 summarizes the findings of a project initiated by the Radiation Protection Unit of DG Environment of the European Commission. The project's primary objective was to provide information for Article 31 experts and EU Member States on the application of the concepts of exemption and clearance for practices according to Title III of Council Directive 96/29/EURATOM of 13 May 1996. The project was divided into three tasks:

Task 1 Compilation of information from Member States.
Task 2 Evaluation of advantages and weaknesses.
Task 3 Identification of the need for improvement.

It is recommended in the RP 134 that the harmonization of exemption and clearance levels between EU Member States is important to reduce complications for cross border movement of materials by the use of common values (as recommended by the European Commission) by all Member States is strongly recommended.

References:

1. European Commission: Radiation Protection No. 89 (1998).
2. European Commission: Radiation Protection No. 113 (2000).
3. European Commission: Radiation Protection No. 122 (2000).
4. European Commission: Radiation Protection No. 134 (2003).