

## ***NOC-CEG Workshop***

### ***Criteria for Environmental Remediation of Radioactively Contaminated Sites: IAEA Guidelines and National Practices***



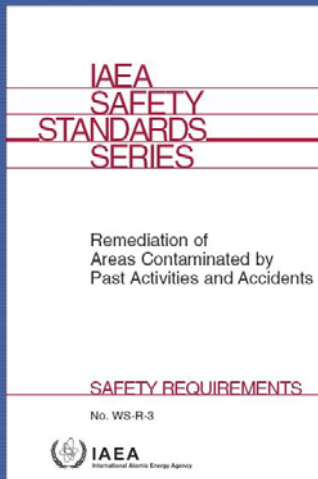
## ***Requirements for Intervention***

**Intervention situations to which the IAEA Basic Safety Standards apply are:**

- **Emergency exposure situations requiring protective action to reduce or avert temporary exposures**
- **Chronic exposure situations requiring remedial action to reduce or avert chronic exposure**
  - **Natural exposure**
  - **Exposure to radioactive residues from past events**
  - **Any other chronic exposure situation**



## Basic Guidelines



3.2 A generic reference level for aiding decisions on remediation is an existing annual effective dose of **10 mSv** from all sources, including the natural background radiation. This normally be assessed as the mean dose for an appropriately defined critical group. Remediation measures would often be justified below the generic reference level and national authorities may define a lower reference level for identifying areas that might need remediation.

3.4 ... An existing annual equivalent dose of **100 mSv** (inclusive of all existing contributions, including doses due to the natural background radiation) to any organ shall justify intervention under almost any circumstances, unless national authorities specifically determine that such measures are not justified.



## Basic Guidelines

4.9 The regulatory body shall establish safety criteria for the remediation of contaminated areas, including conditions on the end points of remediation.

5.1 Remediation of a contaminated area comprises the preparation and approval of a remediation plan; remediation operations; and the management of waste resulting from the remediation activities.

5.5 .....The approved plan shall state, as a minimum: the goal for the remediation; reference levels for remediation; the nature, scale and duration of the remedial measures to be implemented; the waste disposal or storage site, as appropriate; any post-remediation restrictions; and the monitoring and surveillance programmes and arrangements for institutional control for the remediation area.



## Current practice

Future use of the site should be defined and agreed.

Risk-based approach should be applied.

Cost-Benefit analysis and optimisation of remediation activities is necessary. This is especially important when resources are limited.

Interaction with regulators and with other stakeholders is crucial.



## Basic Guidelines

IAEA Safety Standards  
for protecting people and the environment

Remediation Process  
for Areas Affected by  
Past Activities and  
Accidents

Safety Guide  
No. WS-G-3.1



3.21. Dose criteria cannot be directly measured therefore it is necessary to use assessment models to derive operational quantities that can easily be measured, .....such as activity concentrations in **Bq/g** or **Bq/m<sup>3</sup>**. This should enable the responsible party to implement remedial actions and demonstrate compliance with the dose criteria.

## Basic Guidelines

3.23. On the basis of a generic reference level for the total effective dose of **10 mSv/a** (or lower levels if specified by the regulatory body), nuclide specific reference levels for remediation, expressed in terms of bulk activity concentration (for soil and other material) as well as surface activity concentration, should be calculated by acceptable methods and in consideration of the components (e.g. material characteristics).



## Basic Guidelines

### Unrestricted use (6.5)

The sum of all possible combinations of doses to members of the public due to exposures from all subsequent practices should not exceed an additional dose of **1 mSv/a** over the original background level before the first practice began.

An additional dose due to remaining contamination should not exceed **300  $\mu$ Sv/a** over the original background level.



## Basic Guidelines

### Restricted use (6.7)

Some types of use are allowed while others are not.

In cases where all reasonable remediation options are insufficiently protective or in cases where the optimized remediation options do not include removal of contamination itself, specific restrictions on the future uses of the contaminated areas are required to be imposed.



## Basic Guidelines

### Restricted access

6.8. Restriction of access to contaminated areas is required to be maintained in cases of serious residual contamination. The degree of any such restrictions should be defined by the regulatory body.

... access control measures may vary from the placing of warning signs to fencing of various types and guarded control stations.

6.10. A monitoring and surveillance plan is required to be prepared for any remediated areas where restrictions are maintained after remediation has been completed.



## UK experience

Presented by Mr Lorimer Fellingham, NUKEM Ltd. at the CEG workshop in Stockholm, April 2006.

Widely used practice was to clean up contaminated sites so that the specific activity of the remaining material does not exceed **< 0.4 Bq/g** above background. This corresponds to the waste exemption criteria in UK.

Recent analysis shows that this value generally corresponds to the risk for the critical group of population **< 10<sup>-6</sup> 1/a**.



## French experience

Presented by Mr Bernard Crabol, CEA at the CEG workshop in Stockholm, April 2006.

Based on the Residual dose **< 300  $\mu$ Sv/a** specific activity of different radionuclides could be defined for different use of the site.

Remediation objectives depend on the future use of the site (8 generic scenarios defined by the regulator); examples:

- for public parking site - **1  $\mu$ Sv/a** and **300 Bq/kg** (<sup>137</sup>Cs);
- for building site - **11  $\mu$ Sv/a** and **<300 Bq/kg** (<sup>137</sup>Cs);
- park (presence during 600 hr/a) - **100  $\mu$ Sv/a**.

