

**La Société Française de Radioprotection:
«Les faibles doses dans la vie quotidienne»**

The 2007 ICRP Recommendations on Radiological Protection

Paris, France 24 January 2007

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The System of Radiation Protection

- Types of exposure situations
- Types of exposure
- Identification of the exposed individuals
- Source-related and individual-related assessments
- The three fundamental principles of protection
- Levels of individual dose that require protective action
- Safety of radiation sources
- Implementation

Linear-no-threshold Model

This model is the basis for:

- Averaging and summing of doses
- The concept of effective dose
- The concept of collective dose
- Individual dosimetry
- Keeping dose records

Nominal Risk Coefficients for Stochastic Effects (% Sv⁻¹)

Exposed population	Cancer		Hereditary effects		Total	
	1990	2007	1990	2007	1990	2007
Whole	6.0	5.5	1.3	0.2	7.3	6
Adult	4.8	4.1	0.8	0.1	5.6	4

Summary of Radiation Risks

- The nominal risk estimates are slightly smaller than in 1990, but in the same order of magnitude.
- The overall risk of 0.05 Sv^{-1} continues to be appropriate for purposes of radiological protection.

The Use of Effective Dose, E

- Mainly for planning in prospective situations
- For compliance of dose restrictions to control stochastic effects
- **Not** for detailed retrospective dose and risk assessments after exposure of individuals
- **Not** for epidemiological studies

The Use of Collective Dose, S

- For optimisation and for comparing radiological technologies and protection options
- **Not** a tool for epidemiologic risk assessment
- **Not** for predicting number of cancer deaths due to trivial exposures to large populations

Principles of Protection

Source related:

- Justification
- Optimisation

Individual related:

- Application of dose limits

Practices and Interventions

In both cases,

- There is a maximum level of dose above which the regulator will demand action
- Optimisation of protection will reduce the level of dose at which action is taken
- No action to further reduce doses below the optimised level of protection

Types of Exposure Situations

- **Planned exposure:** situations involving the planned introduction and operation of sources (incl. decommissioning, waste disposal) and medical exposure of patients,
- **Emergency exposure:** unexpected situations that occur during the operation of a planned situation or from a malicious act, requiring urgent action
- **Existing exposure:** situations that already exist when a decision on control has to be taken, incl. natural background radiation and residues from past practices

Dose Constraints and Reference Levels

- Values above which one plans not to go, and below which one strives to reduce all actual doses

Planned exposure:

Dose constraint

Diagnostic reference level

Emergency exposure:

Reference level

Existing exposure:

Reference level

Optimisation and Source-related Restrictions

Planned exposure situations

Dose limit

Dose constraint

Optimisation

Existing and emergencies exposure situations

Reference level

Optimisation

Constraints – Reference Levels

- Apply to all situations
 - **The value will depend on the circumstances**
- An integral part of prospectively optimising protection at the source
- If a relevant constraint or reference level was not complied with
 - **Further protection options must be considered**
 - **Not necessarily a failure of protection**

The Use of Dose Constraints

PLANNED EXPOSURE SITUATIONS

- For planned situations: a basic level of protection, less than limits
- Set for each source to ensure that the dose limit is not exceeded

Setting Dose Constraints

PLANNED EXPOSURE SITUATIONS

- For occupational exposure: typically set by operators or, for small companies, by regulatory authorities
- For public exposure: typically set by regulatory authorities
- For patients' comforters and carers: typically set by the medical profession

The Use of Reference Levels

EXISTING AND EMERGENCY EXPOSURE SITUATIONS

- Prospectively as a level of ambition
- Retrospectively for assessing the effectiveness of protection
- Not a mandatory level that must be achieved

Dose Constraints and Reference Levels

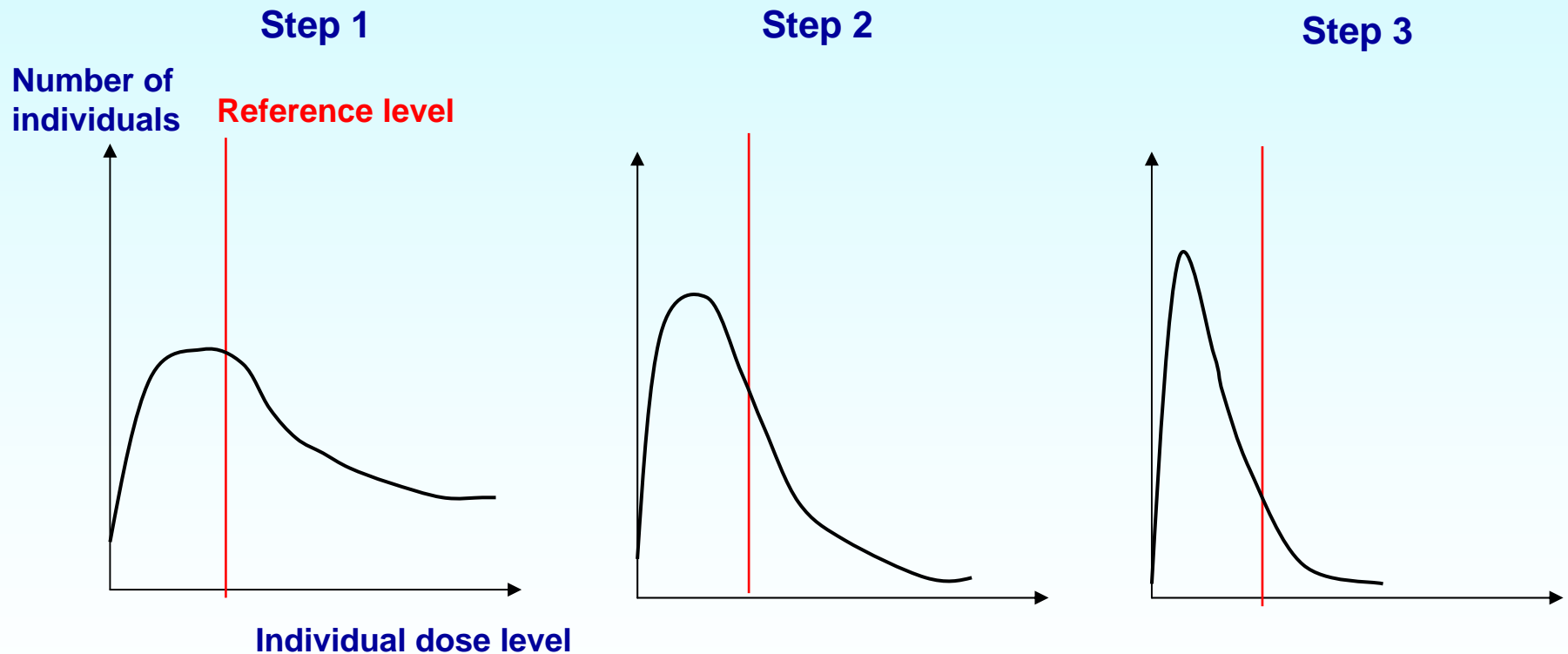
Projected Dose (mSv)	Characteristics and Requirements	Type of Exposure Situation
20 - 100	Exceptional situations. Benefit on a case-by-case basis. Information, training and individual monitoring of workers, assessment of public doses.	Emergency Existing
1 - 20	Individual or societal benefit. Information, education and training. Individual monitoring or assessment.	Emergency Existing Planned
0.01 - 1	Societal benefit (not individual). No information, training or individual monitoring. Assessment of doses for compliance.	Planned

Existing Exposure Situations

- Large distributions of individual exposures
- Often affecting places of living
- Sometime difficult to control (most often controllable through pathways)
- Time is a key parameter (step by step approach)
- In many cases, the level of exposure is driven by individual behaviour

Dose Distribution with Time

EXISTING AND EMERGENCY EXPOSURE SITUATIONS



Emergency Exposure Situations

Publ. 60 and 63:

No action below Action Levels

Recommend values for the **averted** dose for **single** countermeasures where intervention is almost always justified:

E.g.: Sheltering, administration of stable iodine, evacuation, relocation

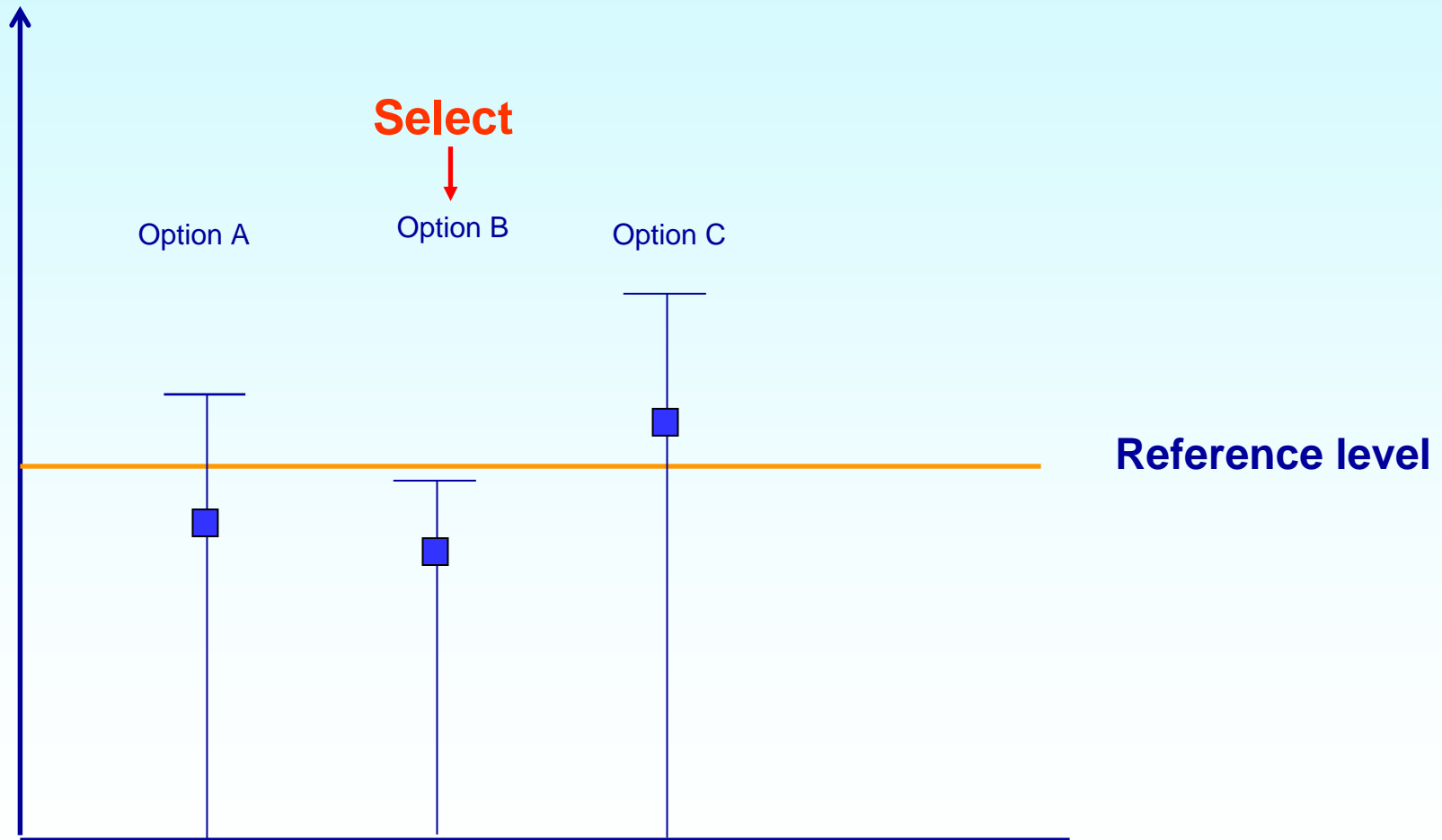
ICRP 2007:

Optimisation below Reference Levels

Recommends an upper value of the **projected** dose (= reference level) received via **all** pathways below which optimisation is applied.

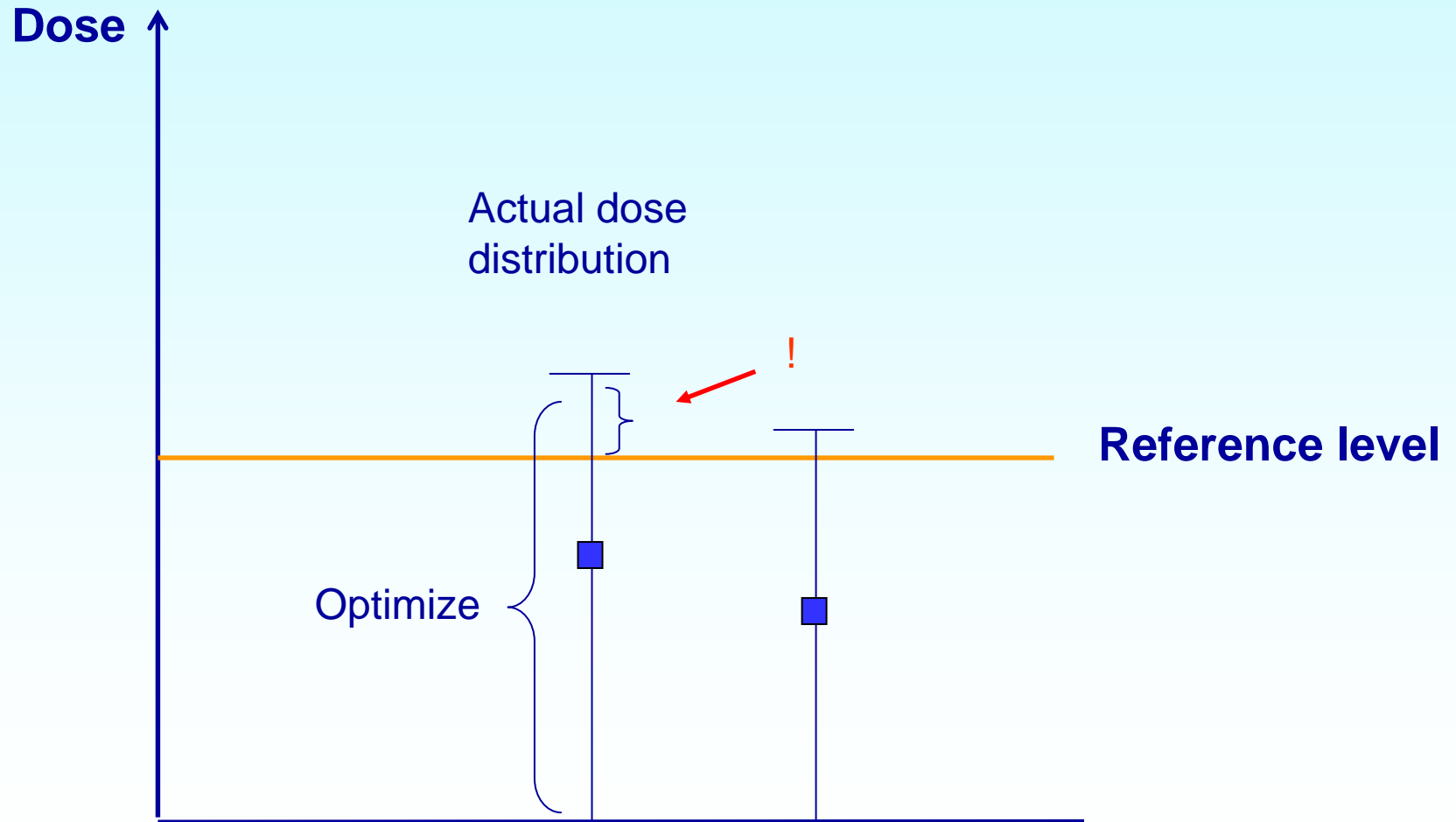
Reference Levels for Preparedness

= PROSPECTIVE

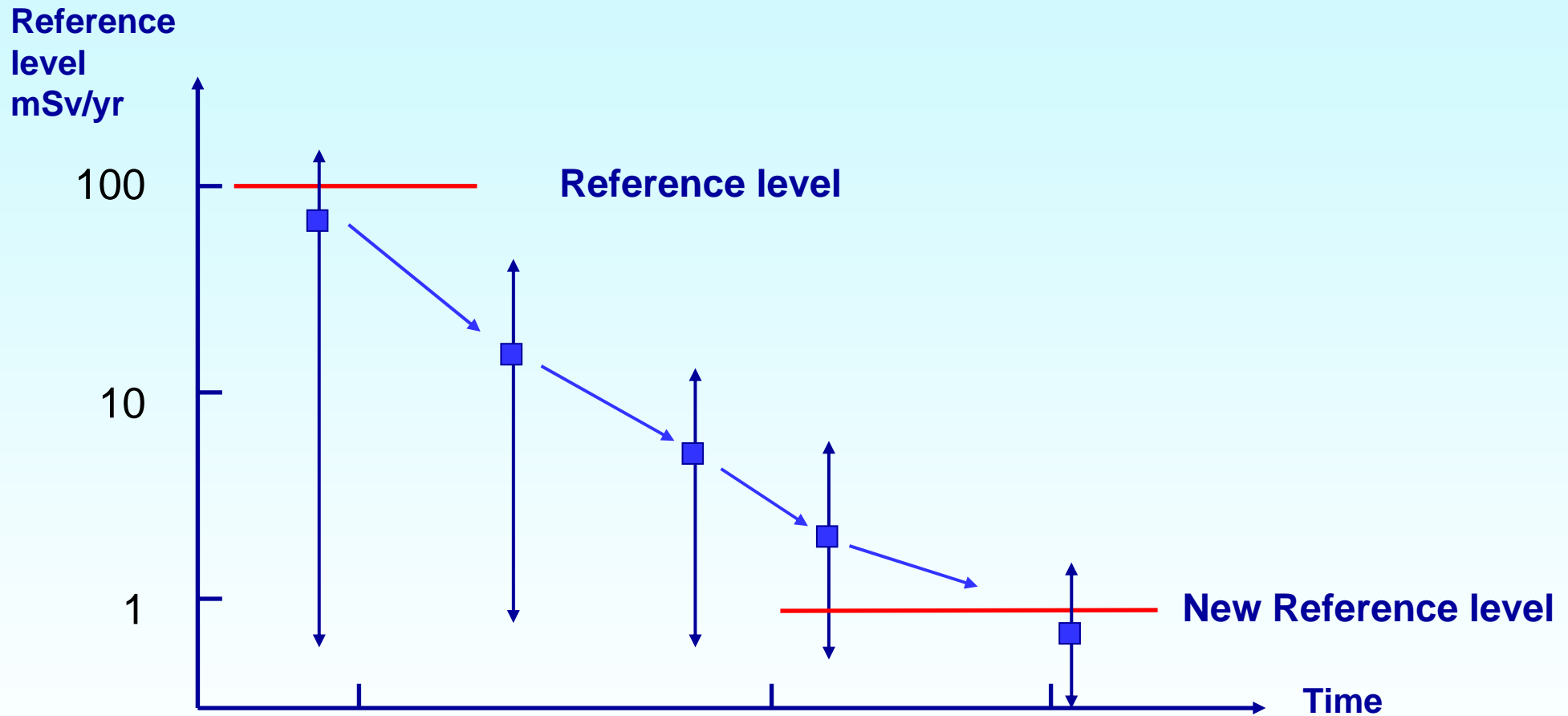


Reference Levels for Emergency Response

= RETROSPECTIVE



Application of Reference Levels



Conclusion – Reference Levels

- Basically, the same approach as for constraints in planned situations:
 - Characterizing the exposure situation
 - Setting a level of ambition (reference level)
 - Optimising protection taking into account the prevailing circumstances
- Iterative process for implementing optimisation
- Improvement of the level of protection for existing and emergency situations

The Types of Dose Restrictions in the System of Protection

Type of exposure situation	Occupational Exposure	Public Exposure	Medical Exposure
Planned	Dose limit Dose constraint	Dose limit Dose constraint	Diagnostic reference level
Emergency	Reference level ^a	Reference level	Not applicable
Existing	Reference level	Reference level	Not applicable

^a Long-term recovery operations should be treated as part of planned occupational exposure

Time Schedule

- January 2007: Progress report on ICRP's website
- March 2007: Adoption of the new recommendations