Radon and the System of Radiological Protection

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New ICRP recommendations

- In progress (public consultation very soon)
- Describe and clarify the application of ICRP 103
- Remain in line with ICRP 65
- Take into account the Statement on radon and future ICRP 115 (nominal risk x 2)
- Simple and pragmatic (no problem without solution)
Characteristics of radon exposure (1)

- People exposed in dwellings (essentially), workplaces and mixed-use buildings

- Existing exposure situations
  - Source already exists and cannot be deleted nor modified (control only on the pathways)
  - Particular status of U mines
Characteristics of radon exposure (2)

• Similarities with other existing exposure situations
  • In particular with exposures in contaminated territories (ubiquity, variability, individual behaviour, self-help protective actions, many players...)

• Many challenges
  • Public health dimension, lack of awareness, consistency with other policies, global risk versus highest exposures (equity), responsibilities, efficiency...
Recommended approach

- **Simple and realist**
  - Same for smokers and non-smokers

- **Integrated**
  - All buildings whatever their occupants
  - Mainly a public health dimension

- **Graded**
  - According to responsibilities
  - Taking into account specific situations (underground, spas)

- **Ambitious**
  - Through the selection of the reference level
  - Addressing both the highest exposures and the global risk
Application of the principles (1)

- Justification of protection strategies
  - Decision by national authorities to implement a national action plan which is expected to do more good than harm
Application of the principles (2)

- **Optimisation of protection**
  - A unique reference level = **10 mSv/a**
  - Upper value of RL for dwellings = **300 Bq.m⁻³**
  - Idem for mixed-use buildings and “ordinary” workplaces
  - **Graded approach** according to responsibilities (landlord, seller,...)
  - Specific graded approach for **workplaces**
    - 1st step = idem than dwellings
    - 2nd step = realism < 10 mSv/a
    - 3rd step : if > 10 mSv or when national positive list of radon prone work activities (underground, spas...) = occupational exposure
Application of dose limits

- Not a requirement for occupational exposure but a principle applicable only in planned exposure situations
- Already applied in U mines
- Other cases? (e.g. when occupational exposure)
All buildings
  - General case: collective protection through control of building
  - A few specific cases: control of individual doses

National Reference Level
  - According to the national situation

Crescendo of measures
  - Information, measurements, remediation, support (technical, financial...)
  - Encourage self-help protective actions
  - Priorities, more or less enforcement, more or less consequence of failure
National action plan (2)

- **New buildings**
  - Prevention
  - Coherence with energy saving programmes

- **Existing buildings**
  - Mitigation

- **ALARA with ambition**
  - Not just below the RL
Discussion (1)

• **What means occupational exposure?**
  • When radon exposure to workers can reasonably be regarded as being the responsibility of the operating management (Pub 103 § 178)

• **What about workers not occupationally exposed?**
  • Managed as members of the public (Pub 65 § 86)

• **Entry point:**
  • Ambiguity of the concept
  • 1,000 Bq.m⁻³ is too high
Discussion (2)

• Application of **dose limits** (controversial issue)
  • In all workplaces? Responsibility of employer, consistency of the protection at work
  • But problems
    • With adventitious radon exposure (offices, shops, workshops...)
    • In mixed-use buildings (What dose limit? Public/Occupational?)
    • With added dose
    • With other sources of radiation
  • In any case the upper value of tolerable risk for occupational exposure should not be exceeded (100 mSv/5 years with a maximum of 50 mSv in a year)
Building or location

Dwellings

Mixed use buildings

Workplaces

Reference level = 10 mSv/y i.e. 300 Bq/m³ (in dwelling exposure conditions)

Measurement

If < 300 Bq/m³

ALARA

OK

Measurement

If > 300 Bq/m³

ALARA

Measurement

If < 300 Bq/m³

OK

If > 300 Bq/m³

Realistic approach

If < 10 mSv/a

If > 10 mSv/a

Occupational exposure

Optimisation

Limits?

A few cases (mines, spas...)

TG81: general approach
Other points

- Exposure to thoron is not a problem

- Uranium mines: waiting for the dose conversion factors from the Committee 2

- Approach expected to be applicable in all existing exposure situations
Exposure to natural radiation

Diagram showing the sources of natural radiation, including Radon and Cosmic rays, and their effects on exposed individuals in both unmodified and modified situations.

Sources
- Radon
- Cosmic rays
- NORM

Unmodified
- Pathways
- Exposed individuals

Modified
- Adventitiously
- Pathways
- Exposed individuals
- Deliberately
- Pathways
- Exposed individuals

Existing exposure situations

Planned exposure situations
Main messages

- Start with an action plan for dwellings
  - Most part of the risk (because of time spent at home)
  - Prevention + mitigation
  - Optimisation below a RL, applied to the building
- Extend the action plan to mixed-use buildings
- Idem for “ordinary” workplaces
  - Adventitious radon exposure
  - Important part of the risk (not yet addressed)
- Do not forgot the cases where radon is not adventitious
  - Determined with quantitative/qualitative criteria
  - Small part of the risk but individual doses may be high
  - Occupational exposure (control of individual doses)

Dose limit = flexibility (choice at national level)