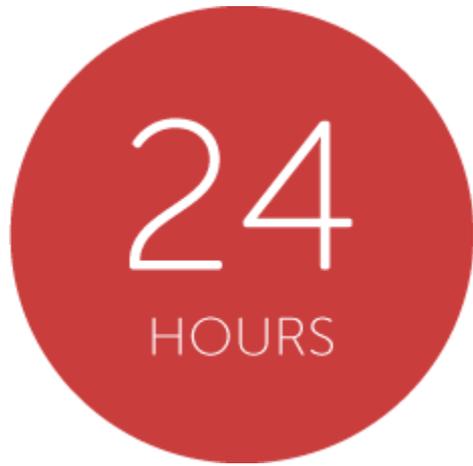


Sebastian Feige, Henrich Meyering

The new view on natural radioactivity Radon and NORM in the light of the revised German radiation protection regulation

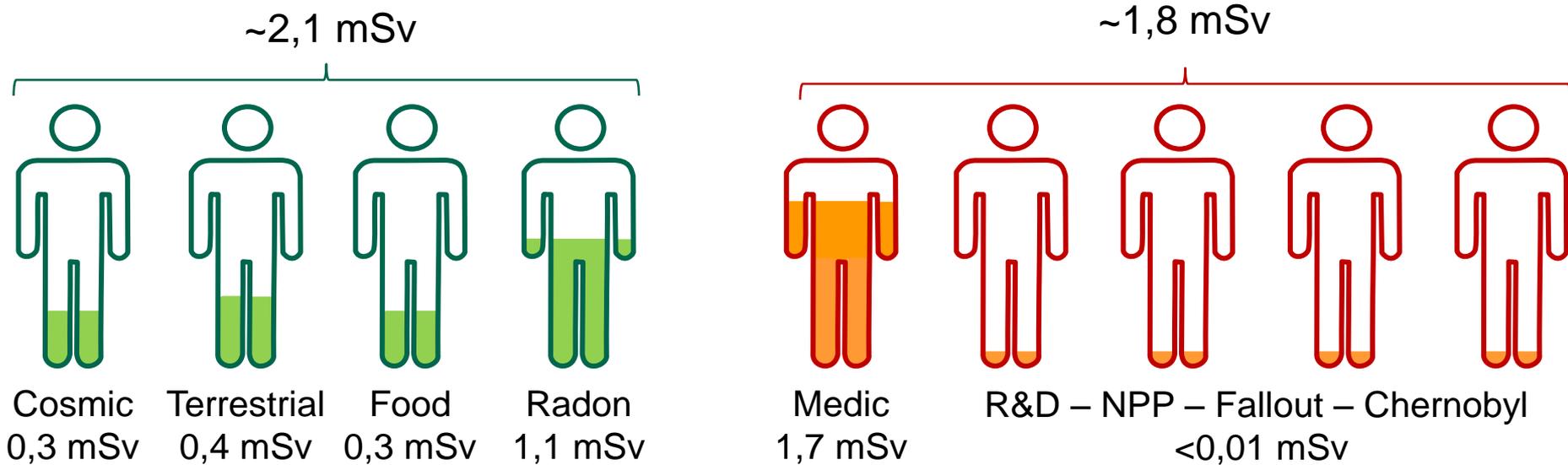


Natural radioactivity is an inevitable part of our environment,
and the main part of the annual dose stems from
natural sources!

We are permanently exposed!

Natural sources vs. man-made sources

Effective annual doses in Germany



Source: Umweltradioaktivität und Strahlenbelastung Jahresbericht 2015

- Increasing consideration of natural radiation in international recommendation and national legislation!

Regulation follows recommendation

	Recommendation	Regulation	
	International	EU	Germany
...
1990	ICRP 60		
1996		96/29/Euratom	
2001			StrlSchV Radiation Protection Ordinance Part 3: „Natural Radioactivity“
2007	ICRP 103		
2013		2013/59/Euratom	
2018			StrlSchG Radiation Protection Act



Radiation Protection Act (RPA)

- No changes in the well-known radiation protection principles
Justification – Optimisation – Dose limitation
- New (excerpt)
 - Exposure situations
 - Planned – Emergency – Existing
 - Radiation sources are no longer distinguished between being man-made or natural
 - Radon in dwellings



Practices involving natural radioactivity

Radiation exposure at work – working environments

- Exposure to natural sources at work is always considered as a planned situation
- Working environments with significantly higher exposure due to natural radiation are listed in the regulation
 - “old” positive list (working environments) is extended in the new RPA
 - the handling of NORM residues,
 - cleaning and maintenance activities,
 - production processes involving the input of e.g. zircon,
 - storage of residues requiring surveillance and the attenuation of contaminated areas.

Practices involving natural radiation Registration (work activities) with the competent authority

- In the past:
 - Required if the estimated dose of the worker exceeded 6 mSv/a
 - Dose assessment within 6 months after start of the work activity

- In the future:
 - All employees are considered as radiation exposed workers as soon as they can receive 1 mSv/a as a result of their work
 - Dose assessment prior to the start of the work activity

Extension of “working environments” – Example

- Use of geothermal energy in some regions in Germany
- NORM Scales with kBq/g of NOR
 - **1 mSv a⁻¹ exceeded or not?**
 - How to determine the dose?

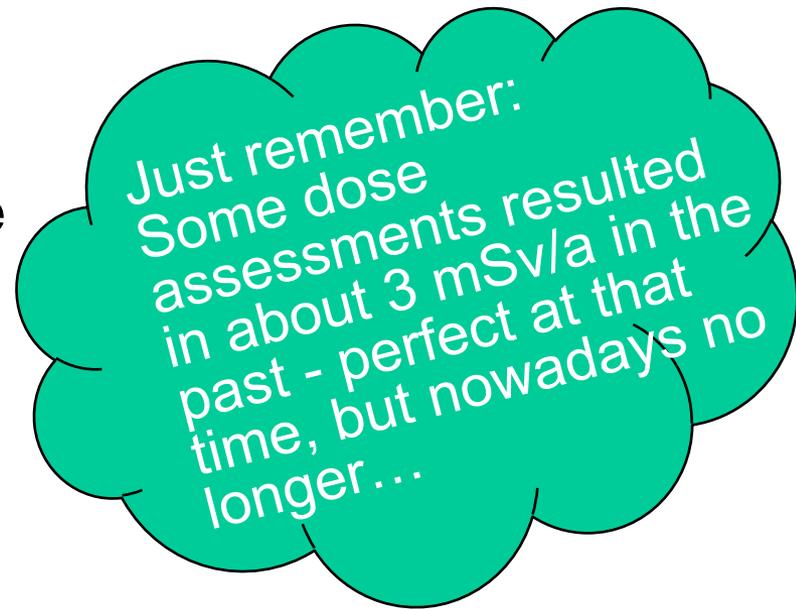


As a consequence

- Is a radiation protection officer necessary?
- Radiation protection during operation and maintenance work?
- How can contaminated parts be disposed of?
- Impact on the population and how to communicate with the public?

NORM: Some questions will remain the same ...

- How high is the uncertainty of predicting that the radiation exposure does not exceed a certain limit?
- Which are the crucial, uncertain parameters that contribute significantly to the calculation of the dose (and its uncertainty)?
- Will future calculation guidelines consider the large uncertainties of input data for dose assessment? What is acceptable?



Frequency of a work practices?
Duration of practices?
Dose rates at place of work?

Radon – German radiation protection legislation

- For the first time comprehensive provisions for the protection against radon in all dwellings and workplaces are specified.
- Radiation exposure from natural radon and its decay products is per definition an existing exposure situation.
- To monitor and optimise doses in existing situations, reference levels (RL) will be used instead of action limits.
- Special attention will be paid to areas where in a significant number of houses the Radon concentration will exceed the reference level.
 - Who to determine these areas?
 - What procedures and criteria will be applied?

Subject to
subordinated
ordinances

Radon action plan (RAP)

- For the implementation of the RAP, appropriate “action plans” are needed and these will require a periodic update every 10 a.
- The RAP can consider four principal topics
 - Regulation and legislation,
 - Radon measurement and other relevant data (based on e.g. the results of radon surveys),
 - Communication and awareness,
 - Building protection and corrective action (remedial action, preventive action).
- The RAP is a long-term project which contains specific tasks attributed to specific subjects and institutional responsibilities.

Radon – at workplaces

A radon concentration measurement is required

- by default for workplaces in the underground or on the first level of a building (within potential Radon areas)
- if the workplace is attributed to one of the work activities as specified in the Appendix 8 (Radon workplaces)

The reference level for the radon exposure at a workplace is 300 Bq/m³ and will be expressed in terms of an annual average activity concentration.

- Radon is easy to measure – but more difficult to determine when it comes to the annual average value

Radon – at workplaces II

- What are the significant changes and consequences?
 - Instead of a radon exposure (Bq h m^{-3}), an activity concentration (Bq /m^3) will be used as a reference level to determine the entry point to radon protection and initial further action.
 - In some industries, internal threshold values were maintained (e.g. $1,000 \text{ Bq/m}^3$) in the past that will no longer comply with the new reference level, even if an estimated dose of the employees will not exceed 1 mSv/a now and in the future.
 - The requirements for the occupational radiation protection regarding a planned exposure situation will demand the installation of Radiation Protection Officers with proven competence.

Radon – dwellings

- For the very first time, a derived upper value for the reference level for radon gas in dwellings of 300 Bq/m³ (annual average) is included in the German radiation protection legislation.
- The majority of the German population is exposed to a low radon concentration and the average radon concentration in dwellings is about 50 Bq/m³.

Radon – further work to be done

Statutory instruments (e.g. Ordinances) will give details on

- How to measure indoor radon and how to determine the annual average value.
- Binding radon mitigation measures in potential Radon areas.

Vast experiences in the monitoring of workers doses at “Radon work places“ have been gained in the past

- Uniform and agreed ways of nationally standardised governance
 - measuring methods to be employed,
 - measuring processes,
 - competence of measuring offices for measurements.



WHAT
YOU
NEED
TO
KNOW?



Take home message

- The new Radiation Protection Act has come into force!
- Proven tools for radiation protection remain intact.
- More stringent action limits for NOR at workplaces.
- Radon in dwellings considered for the first time in the German radiation protection legislation.
- Challenges regarding the implementation of the new legislation into the “everyday” practice!

Thank you – Any questions?



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