#### SOCIÉTÉ FRANÇAISE DE RADIOPROTECTION



# Summary of the third SFRP-IRPA workshop on the application of the concept of tolerability

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- Optimisation principle (ALARA) is the cornerstone of the RP System
- IRPA 14 (Cape town, 2016): need to a **greater visibility** of the decision processes to a **reasonable** level of protection
- **SFRP initiative** about the search of reasonableness
- 1<sup>st</sup> workshop ALARA in Paris (Feb 2017) organised by SFRP
- 2<sup>nd</sup> workshop ALARA in Paris (Oct 2018) organised by SFRP
  - Practical implementation of optimisation in 3 sectors: nuclear, medical, existing exposure situations (radon, radium, post-accident)
  - Case-studies, working groups
- 3<sup>rd</sup> workshop ALARA virtual (May 2021) focused on Tolerable



- In all sectors, optimisation remains a challenge
- A shared point of view: optimisation is a deliberative process to achieve a reasonable compromise with all informed stakeholders
- Each case is a particular case: the "R" of ALARA may be interpreted in a more dedicated way according to the situation:
  - ALAHA Holistically (nuclear)
  - ALADA Diagnostically (medical)
  - ALAQA Qualitatively (post-accident)
  - ALAThecA Technically (NIR)
- It reflects the engagement of **stakeholders**, not the intention to replace the concept of **Reasonably**
- The reflection deserve to be further developed
- Notably on Tolerability



#### Tolerability of risk model in Pub 60 (§150)





#### **Tolerable and Reasonable**

- Pub 60 introduced the tolerability of risk model (§150)
- Notion of reasonable linked with optimisation principle (ALARA)
- Notion of tolerable linked with limitation principle (when it applies)
- Definition of tolerability in Pub 138 (Ethics of RP): the degree or extent to which something can be endured
- Is the Pub 60 model still valid?
- What when the dose limit does not apply?



### 3<sup>rd</sup> SFRP/IRPA workshop on Tolerability

- Virtual on May 4-5, 2021
- About 50 attendees from 15 countries
- Focused on the Tolerable (**boundary of unacceptable**) in RP
- Exploration of the reasonable/tolerable relationship
- Based on case-studies
- In 3 sectors: Radon, NORM, Dismantling
- Reflection in working groups
- **Radon** = existing exposure situation (ExES)
- **NORM** = ExES according to ICRP but authorities often apply DL
- Dismantling = planned ES although some challenges are similar to those in contaminated sites



#### 3<sup>rd</sup> SFRP/IRPA workshop on Tolerability





- Message from Yann Billarand (elected president of SFRP)
  - Shift from top-down to bottom-up
  - Useful to compare radiological/chemical (universal boundary?)
  - Need of a multi-hazards approach (priorities have to be defined)
  - Cf. concept of "exposome" (all pollutants whole life)
- ICRP/TG114: work in progress
- ISO/IEC standard 53-940 Guide 51
  - Either tolerable or not-tolerable (risk mitigation is required)
  - In a given context (including societal values)
  - Iterative risk assessment process



#### 3<sup>rd</sup> workshop – Case-studies

- Radon
  - Norwegian experience of a locality affected by high outdoor and indoor concentrations
  - Swiss strategy for prioritizing radon remediation in existing buildings
  - House in Bessines sur Gartempes built on mining residues (Fr)
- NORM
  - Accumulation in a petrochemical plant in Netherland
  - Legacy of a fertilizer production plant in Spain (phosphogypsum in ponds)
  - Management of residues from coal-fired power plants in Spain

#### Dismantling

- Radium contaminated buildings at Safety Light Superfund (USA)
- Tolerable and reasonable and the dismantling policy in UK
- Dismantling of the Brennilis NPP in France



- What could be the boundary between tolerable and unacceptable?
  - A dose limit? A reference level? Another criterion? By risk comparison?
    A combination of criteria (e.g. dose + time of exposure)? Other considerations than the risk?...
- What is the rationale of the considered criteria ?
  - What about the consistency with the management of other hazards?
- Who should set the criteria? How? When?
- What if the situation is not tolerable? What process should be implemented?
- If actions are implemented to improve the situation, what process or criteria should be used to determine that the situation became acceptable?



# 3<sup>rd</sup> workshop – WGs – Discussion (1)

#### Radon

- Difficult to establish the boundary tolerable/unacceptable (dose, risk, tolerance level ?); does it exist?
- 1 number is not sufficient. Intervals?
- Concept of reference level is inappropriate to be the boundary
- Case by case; qualitative criteria (children, anthropogenic radon...)
- Process: function of time, resources, benefit; prevention/mitigation

#### • NORM

- Radiological protection is generally not central
- Need to adopt a simple but holistic model (multi-hazards, multi-criteria)
- Boundary: dose limit is not always adapted; exceeding the reference level is not a failure; for some people, unacceptable = when they are not involved in the decision-making process
- Qualitative criteria: comparison natural/artificial; human dimension...
- Stakeholders are difficult to mobilize
- Case by case, flexibility



# 3<sup>rd</sup> workshop – WGs – Discussion (2)

#### • Dismantling

- Boundary: dose limit? Combination of criteria (multi-hazards)?
- The level of the risk is lower for public after the fuel is removed and it is of different nature for workers
- Not just one risk criterion
- Take into account the circumstances; need for consistency
- Issue of waste is important (production, transport, disposal)
- Holistic approach (environmental impact)
- Take into account the potential exposure
- Stakeholder involvement is needed
- Iterative process, flexibility, sustainable decision
- Who sets the criteria?: recommendations at the international level; decision by the authorities
- Process: similarities with the safety demonstration
- There is a link between tolerability and justification
- Do not add conservatism, stay realistic
- Tolerability is not only individual, it is also societal
- Need for compromises (protection, costs ...)



- The concept of tolerable is difficult to grasp, in particular for ExES (what is the boundary of unacceptable when dose limits do not apply? Does it exist? Is it a number?)
- It depends on **several factors**, including qualitative ones
- The first one is the level of risk (to be situated on a scale) but it is not necessarily the same for all situations (no magic number)
- Tolerable has complementarities with reasonable but they should not be confused
- The existence of a area of **flexibility** between "acceptable" and "unacceptable" is very useful (unlike ISO approach)



- It is important to take into account all the hazards involved and to properly make a multi-criteria balance between the advantages and disadvantages of the situation (holistic approach)
- The **time dimension** plays an important role:
  - Often we have time to act
  - The situation must be sustainable
- In-depth dialogue with stakeholders is necessary, even if it is sometimes difficult
- In the end, a decision must be taken and **responsibilities** of everyone must be established.
- It is planned to write an article for "Radioprotection"
- Sectors to be explored: medical, environment



#### International context

- IRPA
  - SFRP/IRPA workshops: article in "Radioprotection" in 2019 (<u>https://doi.org/10.1051/radiopro/2019037</u>)
  - Special session on "Reasonableness" in IRPA 15 (Seoul, 2020): article in progress
  - Paper about "An IRPA Perspective on 'Reasonableness' in the Optimisation of Radiation Protection"
- ICRP
  - Task Group 114: Reasonableness and Tolerability
  - Revision of the General Recommendations (ICRP 103)
- NEA
  - Workshop "Rethinking the art of reasonableness", Lisbon, 2020
- EAN
  - Guidelines on the optimisation



# Thank you for your attention