Application of the Commission’s Recommendations to NORM – ICRP TG76

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ICRP-C4

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TG 76 on Protection against NORM Exposure

- Launched in 2010 (Peter Burn chair), membership updated in 2013 (J-Francois Lecomte new chair)
- To develop a report on the application of the Commission’s recommendations (ICRP 103) on radiological protection against enhanced exposures from industrial processes using NORM
- RP System mainly focused on medical staff before WW2 and on nuclear industry after (ICRP 26, 60)
- Concerns about accidents, legacy, natural → ICRP 103
- From practices/intervention to Existing/Planned/Emergency ES
  + Stakeholder involvement
- Series of C4 reports on Existing ES: ICRP 111, 126, 132 + NORM + TG98
- Public consultation expected early 2017
TG 76 Membership

- **Members:**
  - Jean-Francois Lecomte – chair (France)
  - Dejanira da Costa Lauria (Brazil)
  - Philip Egidi (USA)
  - Astrid Liland (Norway)
  - Fu-dong Liu (China)
  - Mika Markannen (Finland)
  - Peter Shaw (UK)

- **Corresponding members:**
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- **C4 critical reviewers:**
  - Analia Canoba (Argentina)
  - Thiagan Pather (South Africa)

- **MC critical reviewers:**
  - Carl-Magnus Larsson (Australia)
  - Sergey Romanov (Russia)
The ICRP System of Protection

Situations
- Existing
- Planned
- Emergency

Categories
- Occupational
- Public
- Medical (patients)
- Environment (biota)

Principles of protection
- Justification
- Optimisation
- Limitation

Dose criteria
- Reference levels
- Dose constraints
- Dose limits

Requisites
- Assessment
- Accountability
- Transparency
- Inclusiveness
NORM in the ICRP system of RP (1)

- NORM are existing exposure situations (ExES), because the source already exists when a decision on control is taken
- Given the situation, some control is needed and should be provided
- A NORM activity should be managed like a PES when the materials are used for their radioactive properties
- It could also be managed like a PES for regulatory purpose
- Whatever the ES, common approach (although nuances): optimisation under restriction, with the aim to achieve an equivalent standard of protection
- Key words: controllability, proportionality, equivalence
NORM cycle

- Extraction
- Process
- Products
- Discharges
- Waste Residues
- Reuse Recycling

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NORM in the ICRP system of RP (2)

- NORM can lead to **public** exposure, **occupational** exposure, **environmental** exposure
- **Justification** of establishing control is necessary
- If control justified, exposures are managed by **optimisation** of protection using restriction on individual doses to reduce inequity, identify exposures which warrant specific attention to reduce their magnitude, and to guide reduction in the entire dose distribution ALARA
- RL in the 1-20 mSv/y band or below , as appropriate
- **Characterisation** of the situation is the 1\textsuperscript{st} step, to determine the **need** for control and the **level** of control
- A **graded approach** is needed
- Radon and thoron exposures should be managed separately according to ICRP 126
**Protection of workers: the approach**

- **Multi-hazard** situation; radiation generally not the dominant risk → integrated approach (all risks)
- **Graded approach** according to:
  - Selection of the RL
  - Selection of the requisites
  - Implementation of selected requisites
- Workers can be **occupationally exposed or not**
- If not, treated in the same way as members of the public
Protection of workers: RL

- Selected in one of the **3 following bands** as relevant:
  - <1 mSv/y
  - From 1 mSv/y to a few mSv/y
  - From a few mSv/y to 20 mSv/y

- **Realistic assessments**

- The selection of the RL does not preclude whether workers are occupationally exposed or not (depending on the requisites needed), except the 3rd band (occup.)

- RL is the **starting point** of the optimisation, not the goal
Protection of workers: Requisites

• 2 series:

• 1 more related to the control of the workplace and the conditions of work (whatever who is the worker)
  • For simple situations, notably (but not exhaustively) when workers are not considered as occupationally exposed

• 1 more related to the control of individuals (personally)
  • With graded implementation according to risk and context
Protection of workers: 1st series of requisites

- **Characterisation** of the situation (who is exposed, when, where, how): Sources (materials), pathways, exposed individuals, dose distribution, releases, evolution; ± detailed, realistic, taking account of existing precautions (for other than radiation)

- **Initial preventive/mitigation actions** to eliminate or reduce hazard (e.g. alternatives, change of the process…)

- **Provision of suitable RP expertise** (internal or external)

- **Demarcation of areas** (+ signing using or not RP symbols)

- **Information** (right to know), instructions

- **Engineering control** (design and layout of facility, retrieval and containment of materials)

- **Working procedures** (arrangements of work, common IPE, record keeping of actions…)

  Regular review of the situation
Protection of workers: 2nd series of requisites

- **Education and training** (level depending on the risks and the involvement of worker in their management; not necessarily related to the level of the RL)
- **IPE** (as relevant, related to radiation risk)
- **Dose assessment**: In perspective of optimisation; method depending on radionuclides & pathways; workplace/individual monitoring, realistic assumptions; relatively easy for external expo; internal expo often already assessed for other purposes, periodic reassessments
- **Dose record** (both workplace data and individual data)
- **Health surveillance** (if relevant, presumably in a few cases, sometime for other hazards)
Protection of public (and environment)

- **Discharges:** Both liquid & gaseous; radioactive or not; assessment (exposures + environmental impact); treatment as relevant; RL in the band 0-1 mSv/y; derived RL may be appropriate; optimisation depending on radionuclides and pathways; environmental monitoring to check no-deviation.

- **Waste:** Solid materials with no use planned; radioactive and not; large volume/low concentration + small volumes/high concentration; dealt with from generation to disposal (if possible); characterisation to determine way of management; treatment as relevant (minimization of volumes or activity); mixing of material may be considered; type of disposal proportionate to the type and hazard (as hazardous waste or as radioactive waste); reinjection in the ground may be possible; generally waste disposal is a PES; RL or DC in the band 0-1 mSv/y.
Protection of public (and environment)

- **Residues**: Recycled and reused, with economic & ecological arguments; may be a new process (with occupational exposure); result is either consumer products or a new ES; may be an issue (easiest to manage as residue than as waste); justification (based on level of doses, pollution, alternatives, future of products, acceptance…); process rarely stopped; RL in the band 0-1 mSv/y (lower range AFAP); no warning or labelling

- **Building materials**: Radionuclides from raw materials or NORM residues; a national list of typical materials of concern should be done; RL in the band 0-1 mSv/y; derived RL already exist (e.g. concentration index); characterisation and control upstream AFAP; strategy encouraging use of BM with concentration < derived RL; difficult to ensure compliance
Protection of public (and environment)

- **Legacy sites**: NORM at the origin of many legacy sites; an issue for TG98; should be avoided; proper decommissioning and dismantling; durable administrative control as necessary; RP and other considerations; RL in the lower range of the band 1-20 mSv/y or below (RL ≠ endpoint); endpoint on case by case; optimisation is a challenge

- **Stakeholder involvement, communication, ethical values**: To be integrated in the report; ethical values: beneficence/non-maleficence, prudence, justice, dignity; open and transparent control; involvement of stakeholders as necessary; dialogue organised to address controversial issues
Optimisation and Dose Criteria

- Identify exposures which warrant specific attention to reduce their magnitude
- Influence the entire dose distribution and shift exposures towards lower values
- Reduce inequity
Emergency and Existing Situations: (step by step process)

Step 1

Step 2

Step 3