

# Revision and Recast of the Euratom Basic Safety Standards: Status report and public consultation

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# Euratom

## Basic Safety Standards (BSS)

- Council Directive 96/29/Euratom sets up a framework for the control of exposure of workers and members of the public to ionising radiation.
- Natural radiation sources are for the first time addressed explicitly (Title VII).
- Exposure to radon in dwellings is not included in the scope.
- No specific requirements on building materials

# EC Recommendations

- Commission Recommendation from 1990 on indoor exposure to radon (90/143/Euratom)
- Commission Recommendation from 2001 on radon in drinking water (2001/928/Euratom)

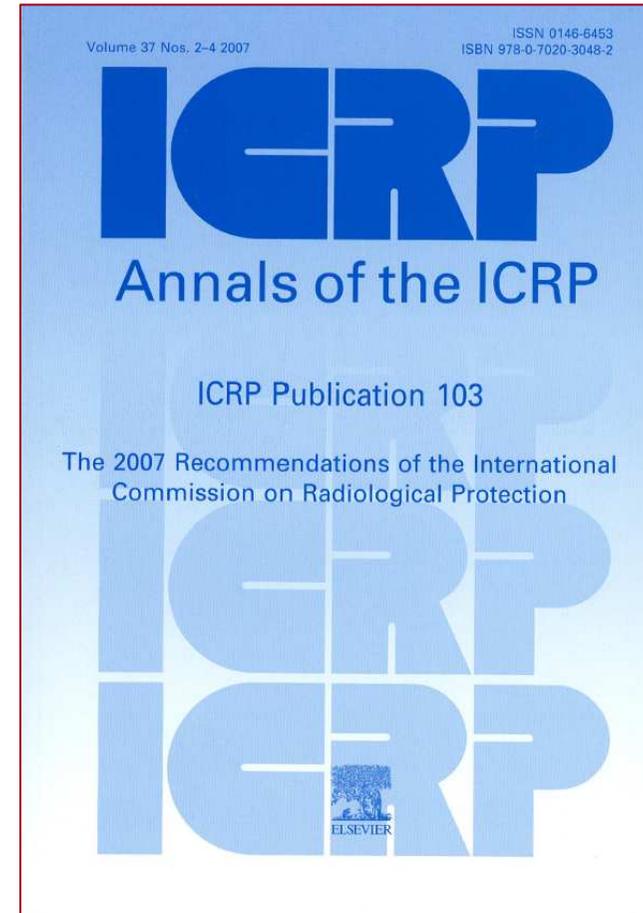
# EC Guidance Reports Radiation Protection Series

- Implementation of Title VII (RP 88)
- Reference levels for workplaces (RP 95)
- Building materials
  - Radiation Protection principles (RP 112)
    - Enhanced radioactivity of building materials (RP 96)
- Exemption and clearance (RP 122 part II)
- Effluents from NORM industries (RP 135)

[http://ec.europa.eu/energy/nuclear/radiation\\_protection/publications\\_en.htm](http://ec.europa.eu/energy/nuclear/radiation_protection/publications_en.htm)

# Revision of EU-BSS

- Allow for ICRP/IAEA
  - Planned, emergency and existing situations
  - Incorporate natural radiation sources
    - Strengthen the requirements
- Review of regulatory control system
  - Graded approach to regulatory control
  - Harmonise exemption and clearance
- Consolidation of current Directives



# Exposure situations

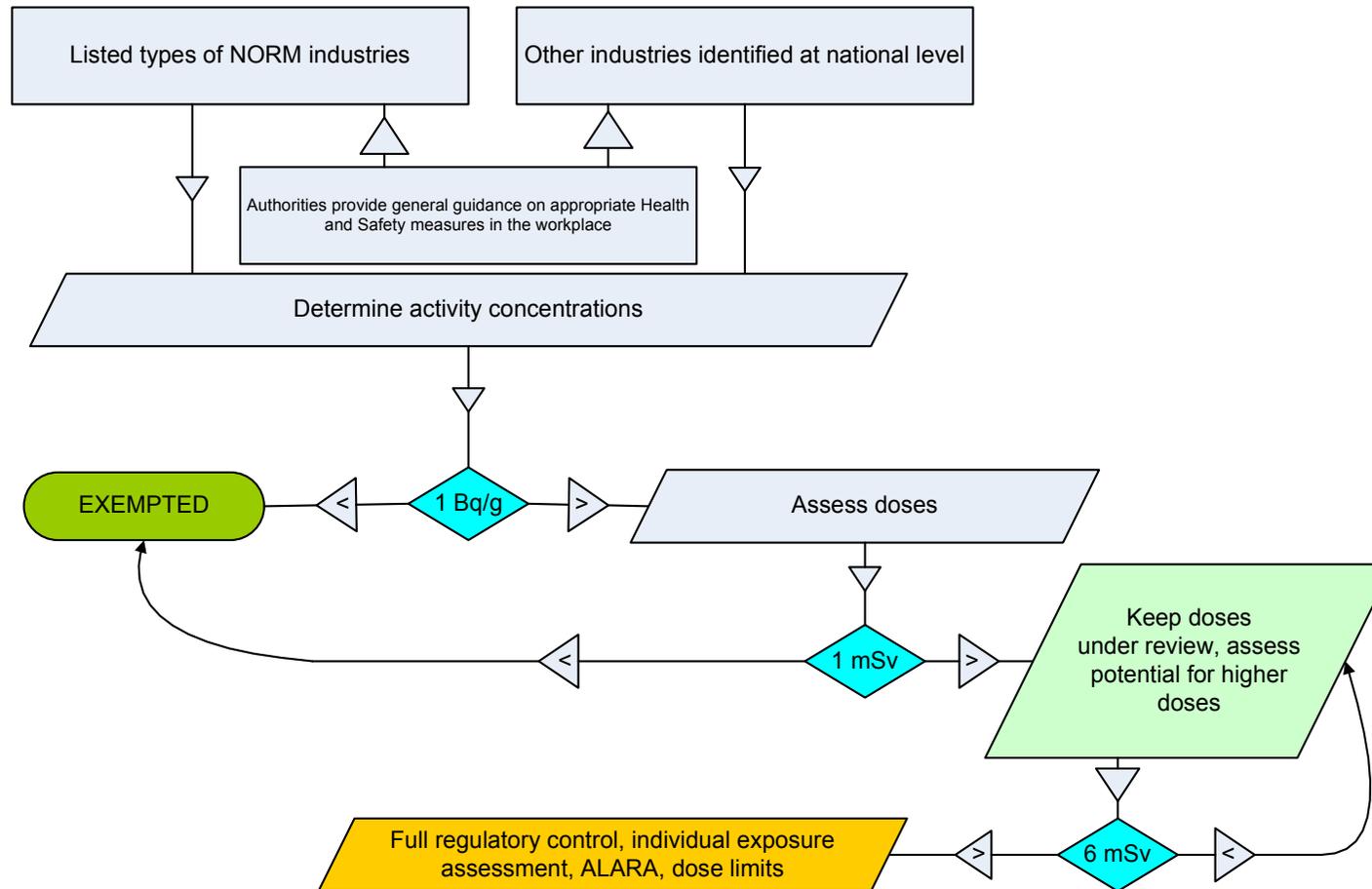
## Euratom approach

- Exposure situations:
  - Planned: new source or new pathway of exposure resulting from the activity
    - NORM industries
    - Aircrew
  - Existing: resulting from features of the location (not the type of activity)
    - indoor radon (ingress from soil)
  - Emergency: urgent situation, which can be planned or prepared for
- Radon in new construction managed in the same way as existing buildings
- Commodities (foodstuffs, building materials)
  - managed together with the exposure situation

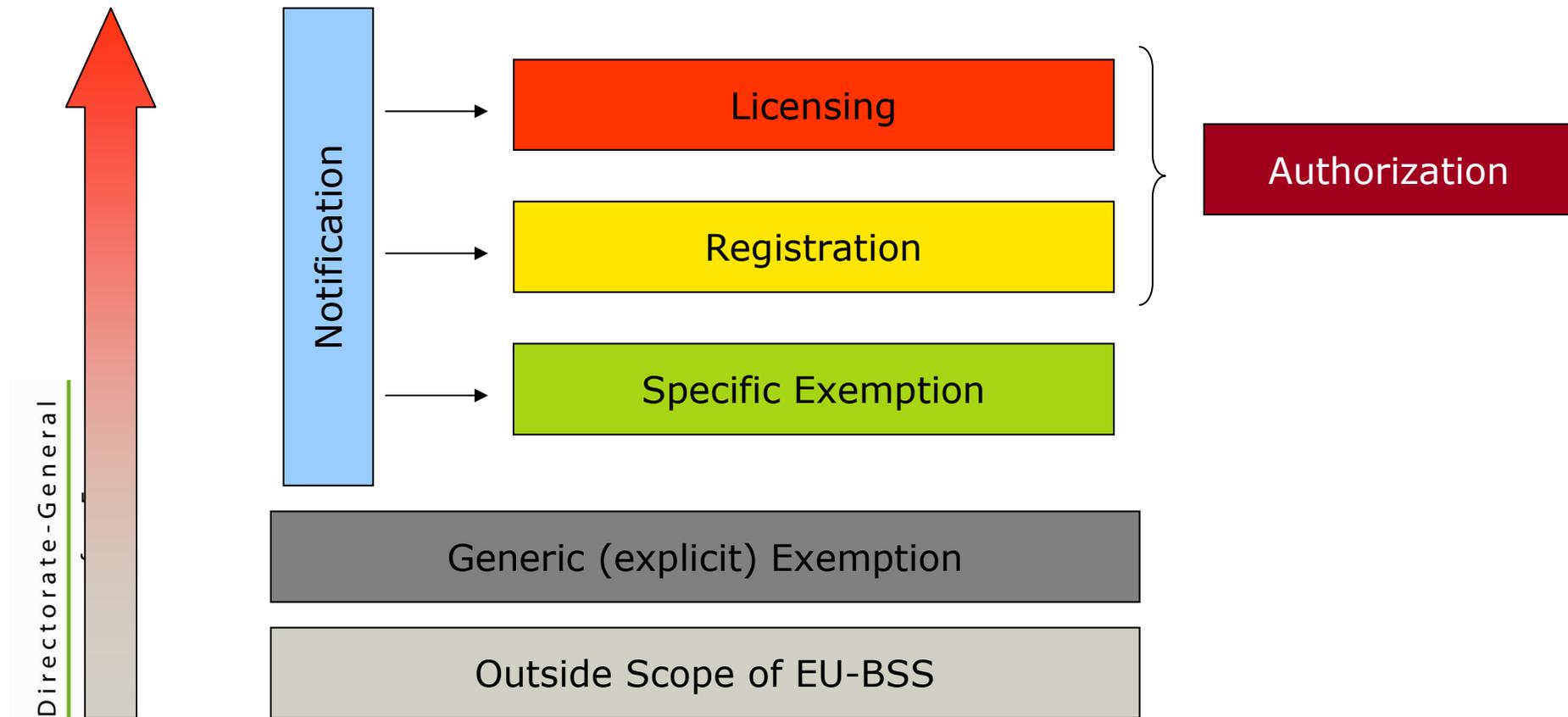
# NORM industries

- List of NORM industries which will require regulatory consideration:
  - Extraction of rare earth from monazite
  - Production of thorium compounds and thorium containing products
  - Processing of niobium/tantalum ore
  - Oil and gas production
  - Geothermal energy production
  - TiO<sub>2</sub> pigment production
  - Thermal phosphorus production
  - Zircon and zirconia industry
  - Production of phosphate fertilisers
  - Cement production, maintenance of clinker ovens
  - Coal-fired power plants, maintenance of boilers
  - Phosphoric acid production
  - Primary iron production
  - Tin/Lead/Copper smelting
  - Ground water filtration facilities
  - Mining of ores other than Uranium ore
- including relevant secondary processes
- Member States may add other relevant activities

# Occupational exposure

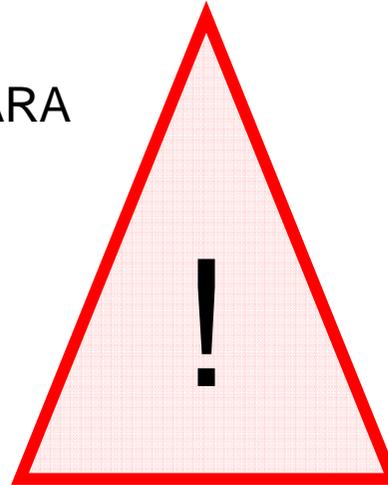


# Regulatory Control Graded Approach



# NORM-industries

- “Positive list” of types of industries
- Activity concentrations above
  - 1 Bq/g (U-238 and Th-232)
  - 10 Bq/g for K-40
- Assessment of doses to workers
  - 1-6 mSv: keep under review / ALARA
  - > 6 mSv: controlled areas
- **Public exposures**



# Radiation protection principles for building materials

## Radiation Protection 112

- Gamma dose criterion
  - 0.3 – 1 mSv / year
  - in excess of outdoor gamma dose rate
- Building materials should be exempted if the gamma radiation increases the annual dose by  $< 0.3$  mSv
- Higher doses than 1 mSv / year should only be accepted
  - in exceptional cases
  - where materials are used locally.
- Activity concentration index for identifying materials of concern

# Building materials

## Activity concentration index

- For identified types of building materials, the activity concentrations of Ra-226, Th-232 (or its decay product Ra-228) and K-40 shall be determined.
- The activity concentration index I is given in the following formula:

$$I = C_{Ra226}/300 \text{ Bq/kg} + C_{Th232}/200 \text{ Bq/kg} + C_{K40}/3000 \text{ Bq/kg}$$

where  $C_{Ra226}$ ,  $C_{Th232}$  and  $C_{K40}$  are the activity concentrations in Bq/kg of the corresponding radionuclides in the building material.

- The index directly relates to the gamma radiation dose, in excess to typical outdoor exposure, in a building constructed from a specified building material.

# Building materials

- Indicative list of materials to be taken into consideration:
  - Natural materials (alum-shale, building materials or additives from natural igneous origin such as granite, gneiss, porphyries, syenite, basalt, tuff, pozzolana, lava)
  - Materials including residues from NORM industries:
    - fly ash, phosphogypsum, phosphorous slag, tin slag, copper slag, red mud (residue from aluminium production), residues from steel production

# Building materials

- Reference level of 1 mSv per year
  - for indoor external exposure from building materials
    - in excess of the background outdoor external exposure
- Below 1 mSv the material is exempted and free on the market in EU
  - Above 1 mSv the national authority may consider appropriate control measures
- Information about the materials relevant for compliance with building codes should be available before their placing on the market
  - CEN/TC standards (construction products)
    - TC 351 workshop on 30.10.2009

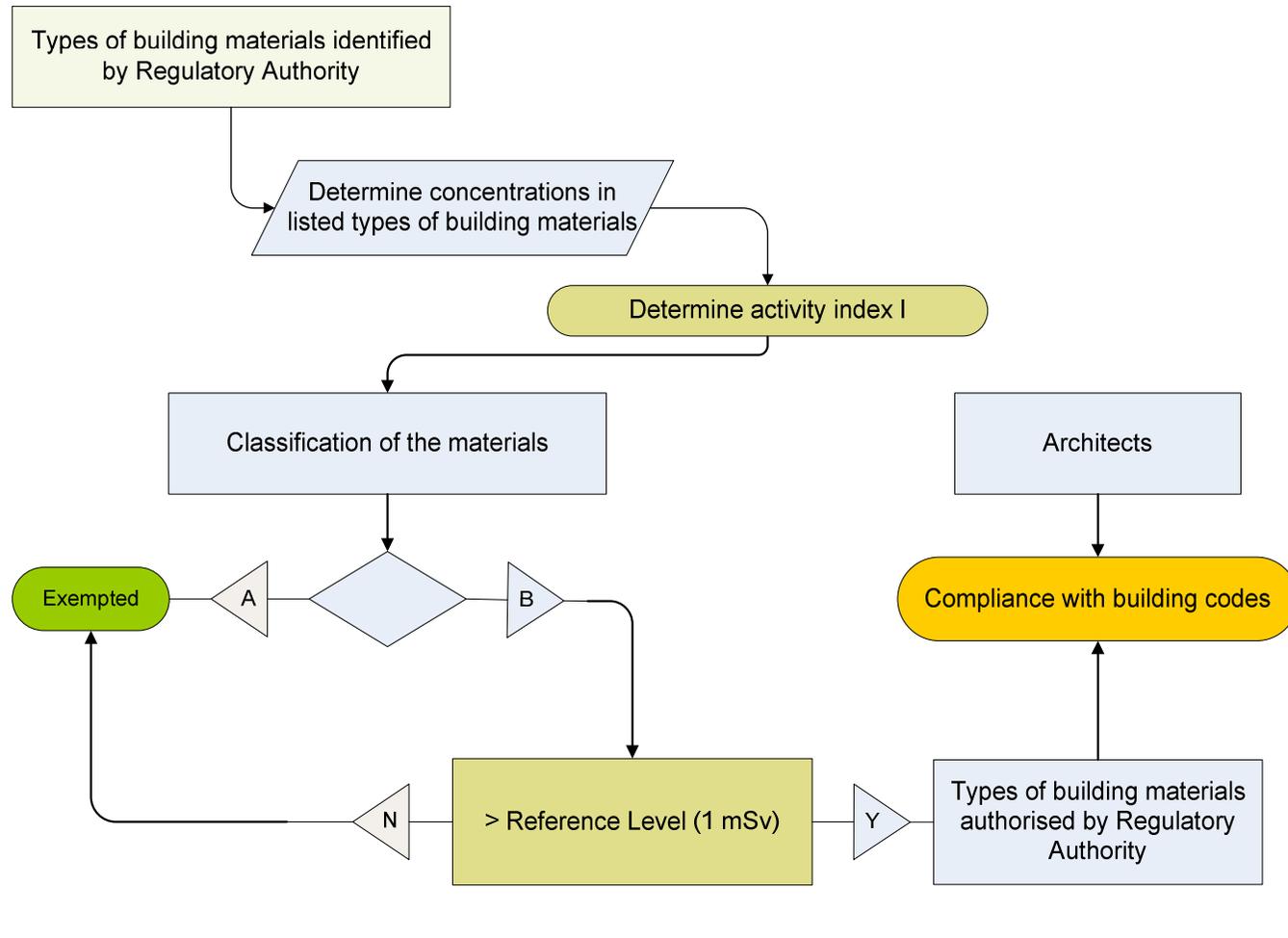
# Categories of building materials

	Category (corresponding default dose)	
Use	A ( $\leq 1$ mSv)	B ( $> 1$ mSv)
(1) materials used in bulk amounts	A1 <b>I<math>\leq</math>1</b>	B1 <b>I<math>&gt;</math>1</b>
(2) superficial and other materials with restricted use.	A2 <b>I<math>\leq</math>6</b>	B2 <b>I<math>&gt;</math>6</b>

The distinction of materials into (1) or (2) according to their use will be based on national building codes.

Where appropriate, actual doses for comparison with the reference level will be assessed using more elaborate models which may also allow for the background outdoor external exposure from local prevailing activity concentrations in the undisturbed earth's crust.

# Building Materials



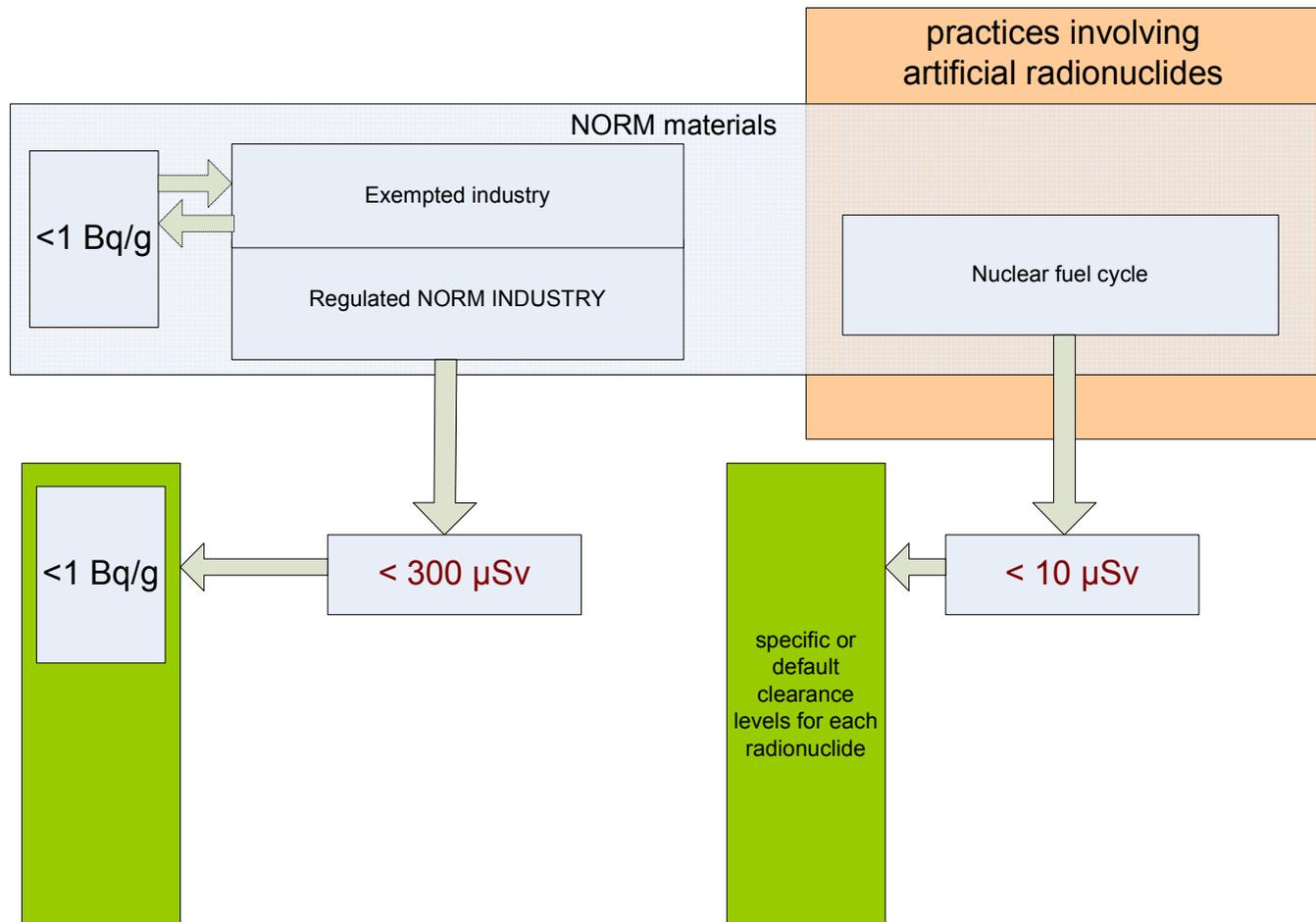
# Exemption and clearance

- Artificial radionuclides: 10  $\mu$ Sv per year
  - RP-65 for exemption (now “moderate amounts”),
  - guidance on clearance levels (now replaced by default values in RS-G-1.7)
- Natural radionuclides:
  - RP 122 part II: 0.3 mSv per year
    - 0.5 Bq/g for U-238 and Th-232 in equilibrium
    - 5 Bq/g for K-40
  - Now: RS-G-1.7 values
    - 1 Bq/g for U-238 and Th-232 in equilibrium
      - 10 Bq/g for K-40
    - both for exemption and clearance
    - subject to dose criterion
      - for exemption: 1 mSv for workers
      - for clearance: 0.3 mSv for public



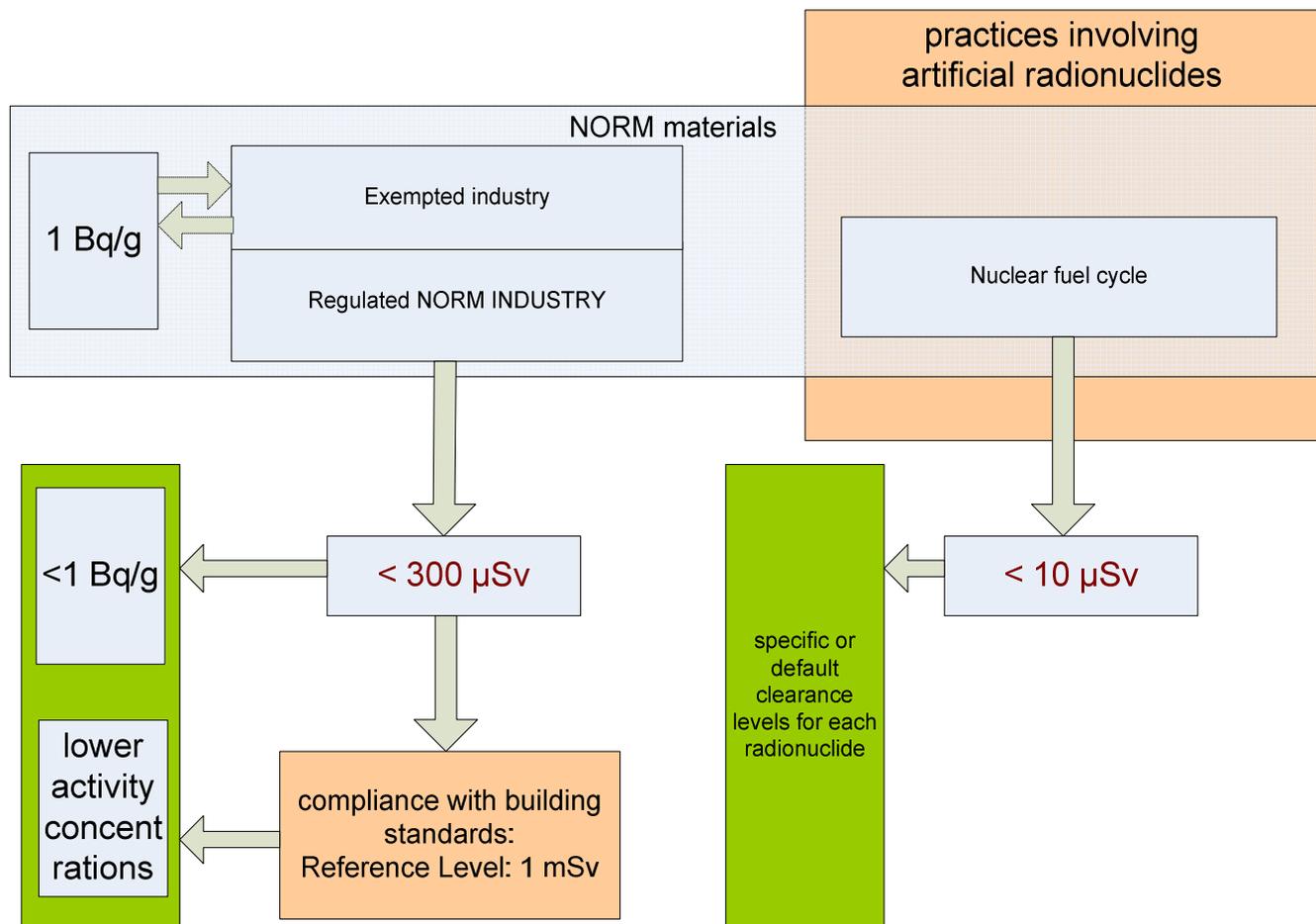
# NORM residues

## Clearance criteria



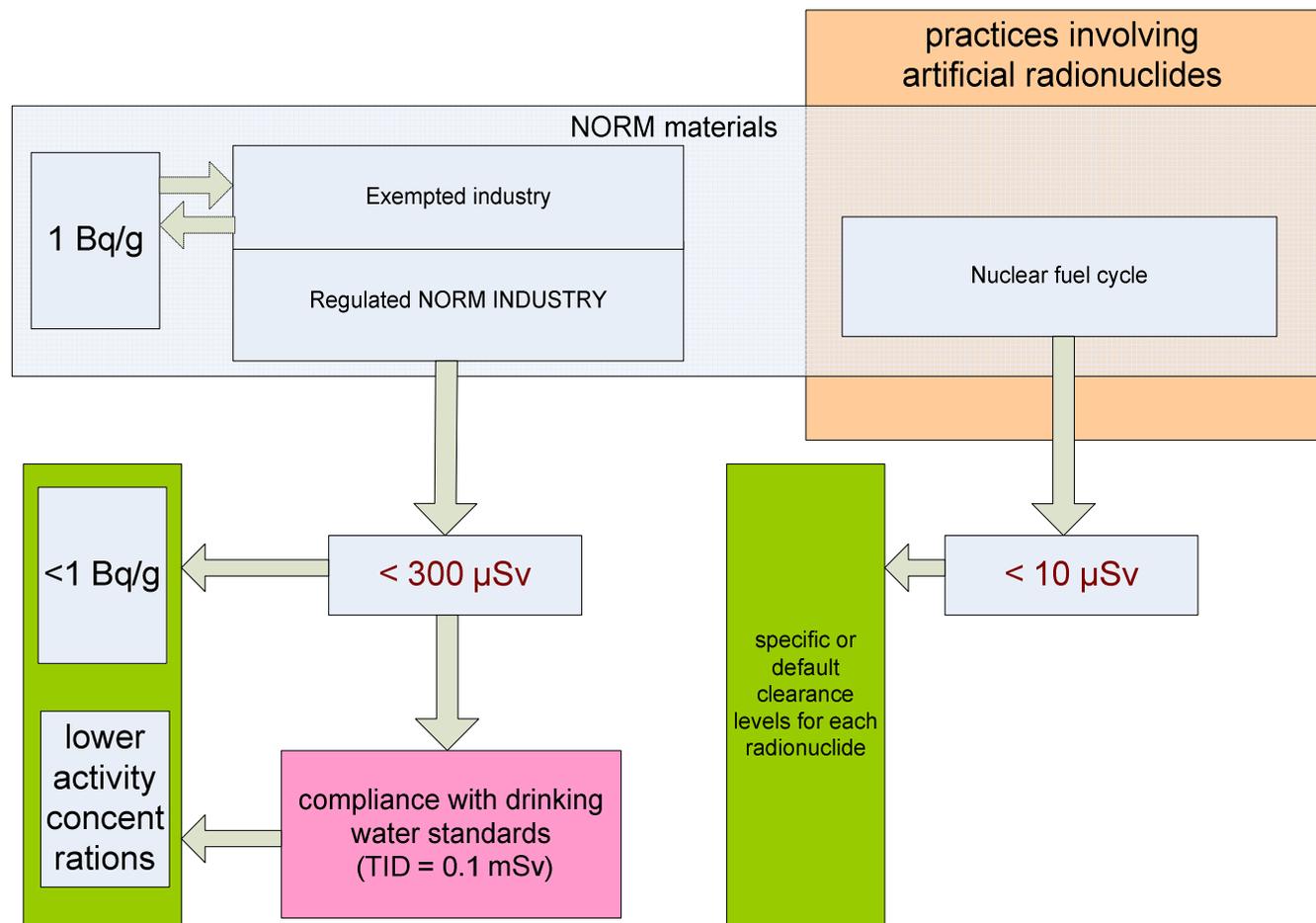
# NORM residues

## Clearance criteria

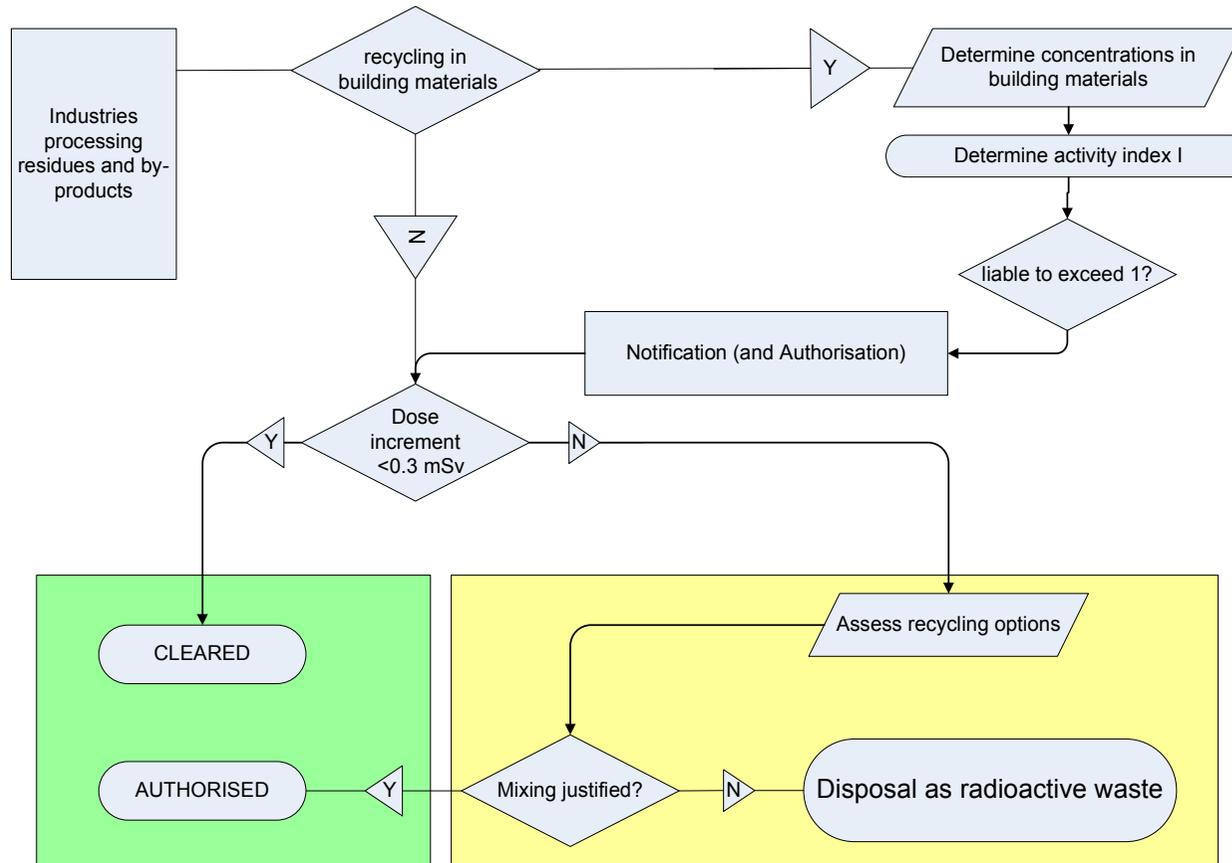


# NORM residues

## Clearance criteria



# Residues from NORM industries



# NORM-residues

- Activity concentrations (1 Bq/g for U-238 and Th-232, 10 Bq/g for K-40) not applicable to
  - (recycling in) construction materials
  - drinking water pathways
- Assessment of effluents and disposal of waste:
  - clearance criterion 0.3 mSv per year
  - recycling (mixing) preferred to radioactive waste disposal
    - subject to regulatory control
  - constraints:
    - solid residues: 0.3 – 1 mSv per year
    - airborne or liquid effluent <<
      - except if in competition with solid residues

# Conclusions

- NORM industries are a planned exposure situation
  - trigger: 1 Bq/g (or 1 mSv per year for workers)
- Building materials now incorporated in BSS
  - as an existing exposure situation
  - activity concentration index
- Recycling of residues from NORM is subject to
  - clearance criteria (0.3 mSv per year)
  - authorisation of mixing with other materials
  - activity index for building materials

# Conclusions

- New EURATOM BSS
  - ICRP recommendations
  - Harmonisation with international Standards
- Integration of natural and artificial sources
  - Graded approach to regulatory control
  - Enhanced rôle of competent authorities
- Harmonisation of regulation of NORM industries and building materials

# Radiation Sources

Radiation Generators

Radioactive Material including  
Radioactive Substances

Radioactive Sources

Sealed Sources

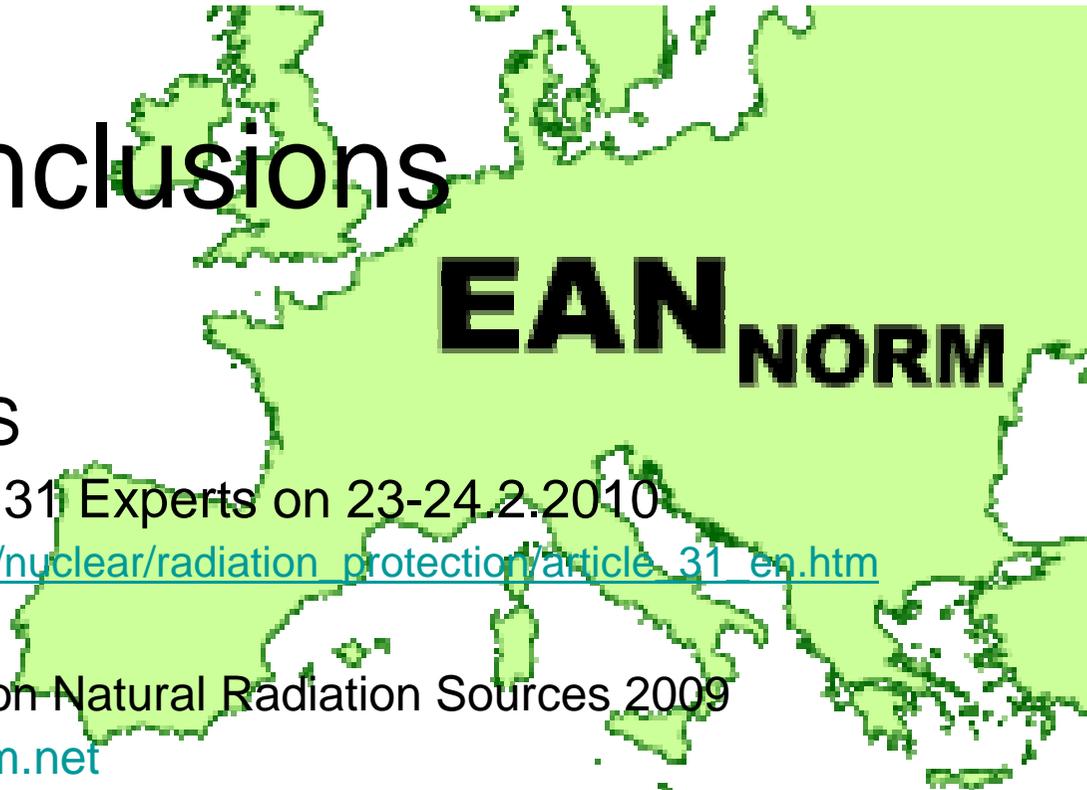
High activity  
Sealed Sources

Orphan Sources

Radioactive Waste

Naturally occurring  
radioactive material

# Conclusions



**EA**  
**NORM**

- New EURATOM BSS
  - Opinion of the Article 31 Experts on 23-24.2.2010
    - [http://ec.europa.eu/energy/nuclear/radiation\\_protection/article\\_31\\_en.htm](http://ec.europa.eu/energy/nuclear/radiation_protection/article_31_en.htm)
  - Impact Assessment
    - public consultation on Natural Radiation Sources 2009
    - <http://www.ean-norm.net>
- Adoption:
  - Commission,
  - EcoSoc, EP,
  - Council,
  - Transposition by MS's: 2014?

# Conclusions

- Harmonisation with international Standards
  - DS 379 Draft 3.0 in “120 days consultation” since 1.2.2010
  - Differences:
    - definitions of radiation sources / facilities and activities
    - existing/planned exposure situations (aircrew, NORM)
    - more comprehensive and cautious use of clearance criteria for NORM residues (dose criterion 0.3 mSv)
    - requirements for building materials
- Co-sponsored by Euratom