

# Revision and consolidation of Euratom Basic Safety Standards

## NORM-industries

European Commission

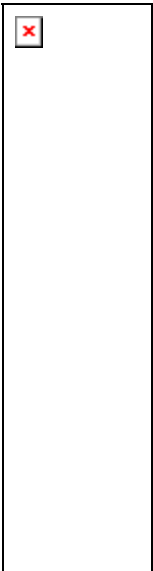
DG Energy

D4: Radiation Protection

Augustin Janssens

# Overview

- Revision and consolidation of BSS
- Exposure situations
- Planned exposure situations
- Existing exposure situations
  - Radon in the workplace
  - Building materials



# Revision and consolidation BSS DIRECTIVE

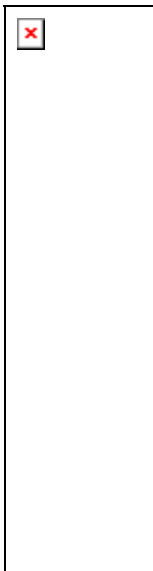
- Article 31 Group of Experts since 2005
- Topical issues
  - natural radiation sources
  - exemption, clearance, graded approach
- WP “Recast”
  - First consolidated draft text: meeting in June 2009
  - Final text for Article 31 Experts in November 2009
- Approval of draft text and related Opinion
  - on 23-24.2. 2010
- Impact Assessment Report
- Inter-Service consultation
- Translation
- Commission proposal adopted on 29 September 2011

[http://ec.europa.eu/energy/nuclear/radiation\\_protection/doc/art31/2010\\_02\\_24\\_draft\\_euratom\\_basic\\_safety\\_standards\\_directive.pdf](http://ec.europa.eu/energy/nuclear/radiation_protection/doc/art31/2010_02_24_draft_euratom_basic_safety_standards_directive.pdf)  
[http://ec.europa.eu/energy/nuclear/radiation\\_protection/doc/art31/2010\\_02\\_24\\_opinion\\_on\\_bss.pdf](http://ec.europa.eu/energy/nuclear/radiation_protection/doc/art31/2010_02_24_opinion_on_bss.pdf)

# RECAST

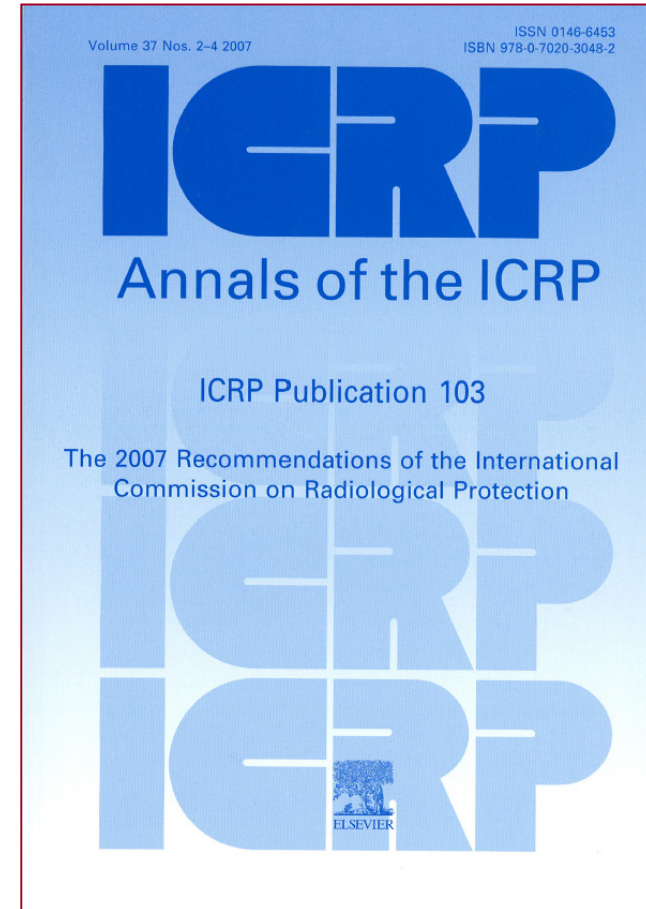
## Better legislation - simplification

- Directives:
  - Basic Safety Standards (workers, general public): 1996
  - Patients/Medical Directive: 1997
  - Informing the public on measures in the event of a radiological emergency: 1989
  - Outside Workers: 1990
  - High Activity Sealed Sources (HASS): 2003
  - (Radon Recommendation 90/143/Euratom)
- Recast:
  - In principle no discussion of unmodified text
  - In practice: too many changes with cross-cutting impact
  - Hence: “**consolidation**”



# Revision of EU-BSS

- Consolidation of current Directives
- Allow for ICRP/IAEA
  - Exposure situations
    - rather than processes: practices/interventions
  - Incorporate natural radiation sources
    - strengthen the requirements



# ICRP Publication 103

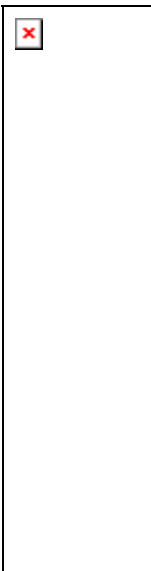
## Scope:

(176) ... applied to all sources and all exposed individuals, in the following three exposure situations:

- planned: ... involving the planned operation of sources (practices in operation)
- existing: ... that already exists when a decision on control has to be taken, including natural background radiation ...
- emergency exposure situations

## Problems:

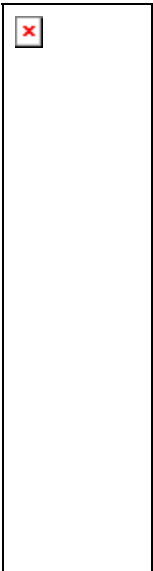
- “planned” associated with the applicable regime of regulatory control
  - notification, registration and licensing of *practices*
  - any (industrial) activity for which an *undertaking* has legal responsibility for its conduct and for the resulting exposure should be managed in the same way as a *practice*
- “existing” has been confounded with “practices that already exist”



# Exposure situations

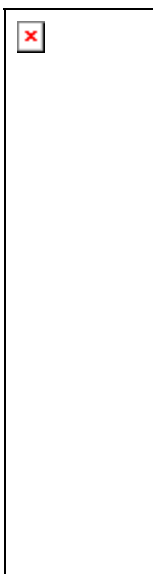
## Euratom approach

- **Planned: new source or new pathway of exposure resulting from the activity**
  - industries processing naturally occurring radioactive materials (NORM)
  - operation of aircraft
- **Existing: resulting from features of the location (not the type of activity)**
  - indoor Radon (ingress from soil)
  - commodities managed together with the exposure situation:
    - building materials (gamma exposure, radon exhalation)
    - foodstuffs (post-accidental situation)
- **Emergency: urgent situation, which can be planned or prepared for**



# Definitions

- Practice: any type of activity that involves the operation or introduction of radiation sources or which alters exposure pathways and is managed as a planned exposure situation
- Undertaking: a natural or legal person which has legal responsibility for carrying out a practice or who has legal responsibility for a radiation source
- Occupational exposure: exposure of workers incurred in the course of their work
  - responsibility of the employer for exposure to radon at work





# Options for structure:

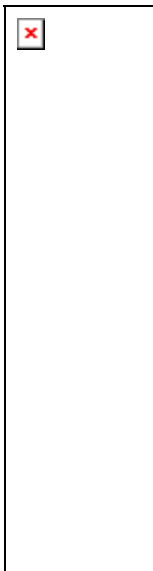
PLANNED EXPOSURE SITUATIONS	EMERGENCY EXPOSURE SITUATIONS	EXISTING EXPOSURE SITUATIONS
Occupational exposure	Occupational exposure	Occupational exposure
Public exposure	Public exposure	Public exposure
Medical exposure		

OCCUPATIONAL EXPOSURE	PUBLIC EXPOSURE	MEDICAL EXPOSURE
Planned exposure situations	Planned exposure situations	Planned exposure situations
Emergency exposure situations	Emergency exposure situations	
Existing exposure situations	Existing exposure situations	



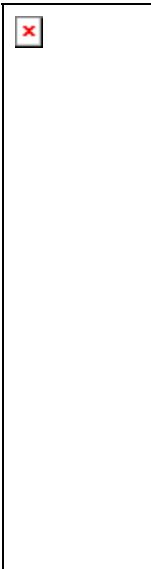
# Table of contents of revised EU-BSS

Preamble	
Chapter I	Subject Matter and Scope
Chapter II	Definitions
Chapter III	System of Protection
Chapter IV	Requirements for Education, Training and Information
Chapter V	Justification and Regulatory Control of practices
Chapter VI	Protection of Workers, Apprentices and Students
Chapter VII	Protection of Patients and other Individuals submitted to Medical Exposure
Chapter VIII	Protection of Members of the Public
Chapter IX	Protection of the Environment
Chapter X	Requirements for Regulatory Control
Chapter XI	Final provisions



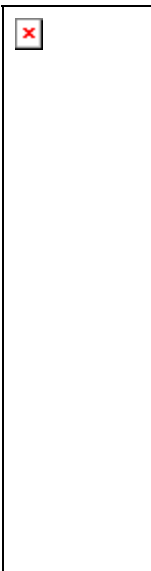
# System of Protection Principles

- Justification of practices
- Optimisation of protection
  - *constraints* in planned exposure situations
  - *reference levels* in existing or emergency situations
- Dose limits
  - effective dose (stochastic effects)
  - organ dose (tissue effects)



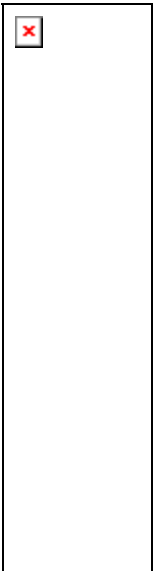
# Reference levels

- Bands of reference levels for public exposure and corresponding societal criteria
- RL in the range 20 mSv – 100 mSv for *emergency* exposure situations
  - below 20 mSv if no disproportionate detriment or excessive cost of countermeasures
- RL in the range 1 to 20 mSv per year for *existing* exposure situations
  - radon exposure
  - long-term post-accidental management
- RL below 1 mSv for specific pathways of exposure



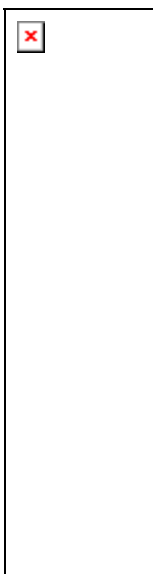
# Planned exposure situations

- NORM industries
- Aircrew
  - Same as in Directive 96/29Euratom
- Space-crew
  - Specially authorised occupational exposures



# List of industrial practices (including secondary processes)

1. Extraction of rare earths
2. Production of thorium compounds
3. Niobium/tantalum ore
4. Oil and gas
5. Geothermal energy
6. TiO<sub>2</sub> pigment production
7. Zircon and zirconium industry
8. Thermal phosphorous production
9. Production of phosphate fertilizers
10. Cement production
11. Maintenance of boilers of coal-fired power plants
12. Phosphoric acid production
13. Tin/lead/copper smelting
14. Ground water filtration
15. Mining



# Justification and regulatory control of planned exposure situations

## Graded approach

- Proportionality
- Effectiveness of regulatory control

Member States shall require any notified practice to be subject to regulatory control commensurate with the magnitude and likelihood of exposures resulting from the practice,

# Justification and regulatory control of planned exposure situations

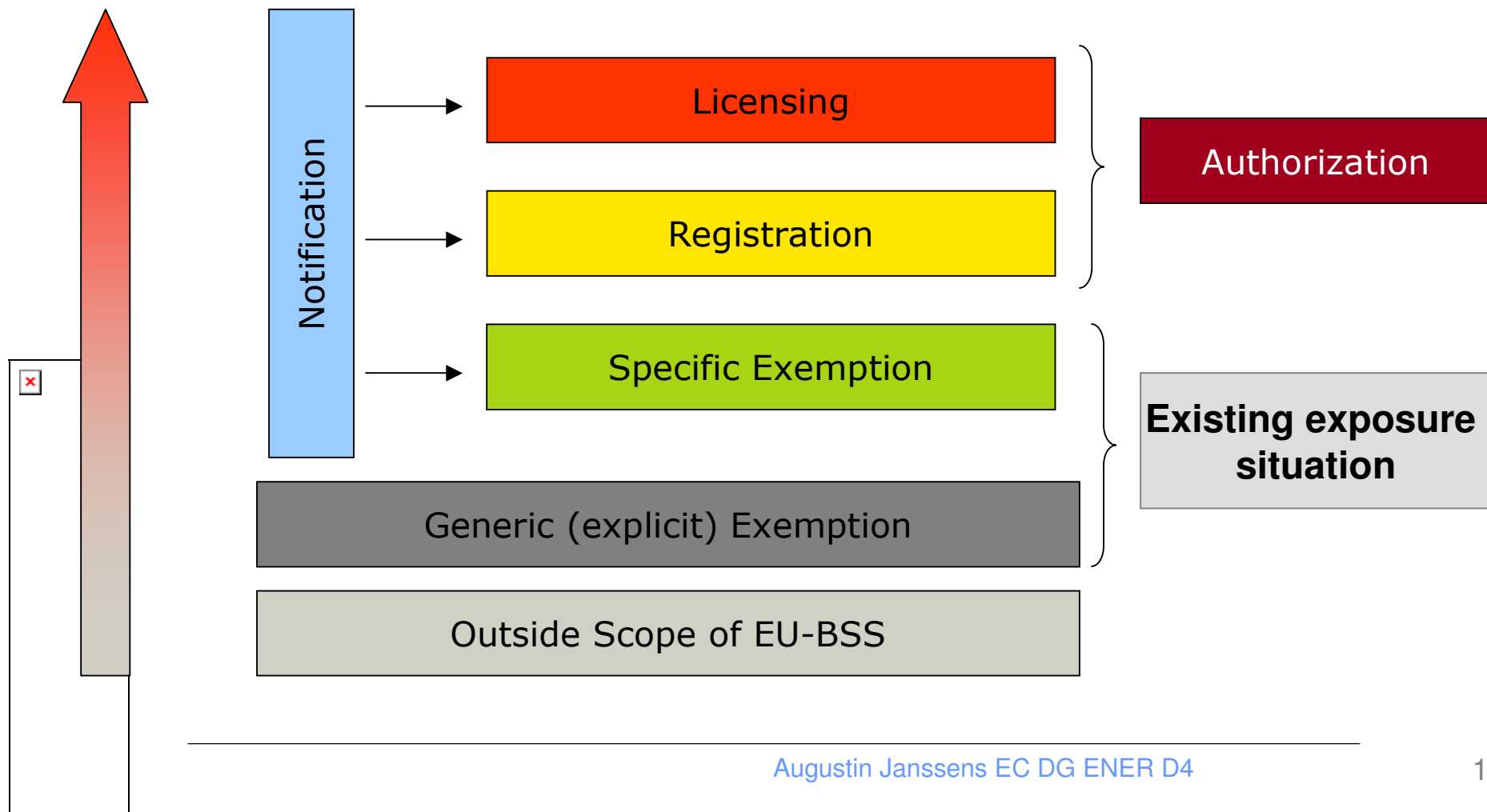
## Graded approach

- Proportionality
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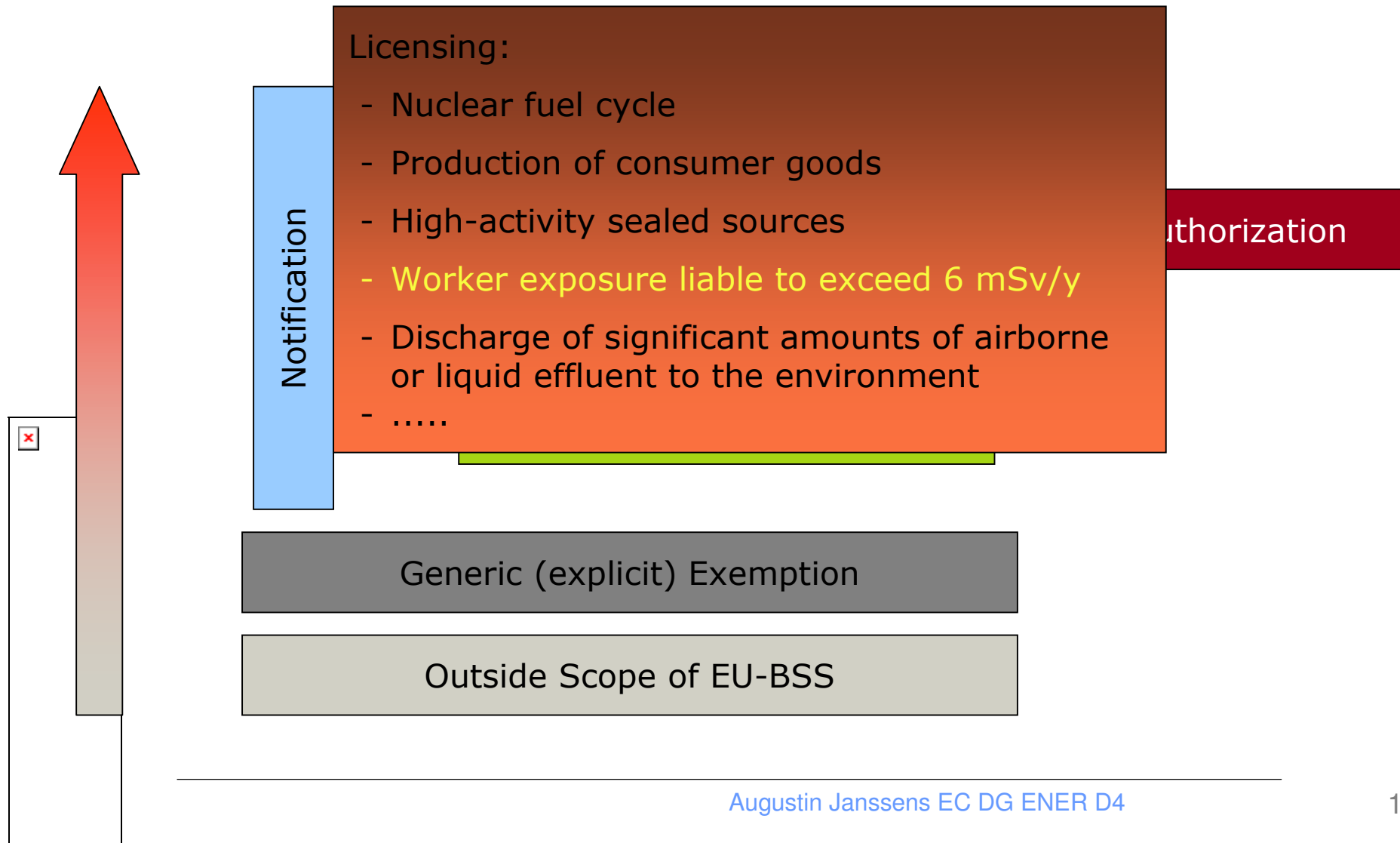
Member States shall require any notified practice to be subject to regulatory control commensurate with the magnitude and likelihood of exposures resulting from the practice, and commensurate with the extent by which regulatory control may have an impact on reducing such exposures or improving the safety of the installations



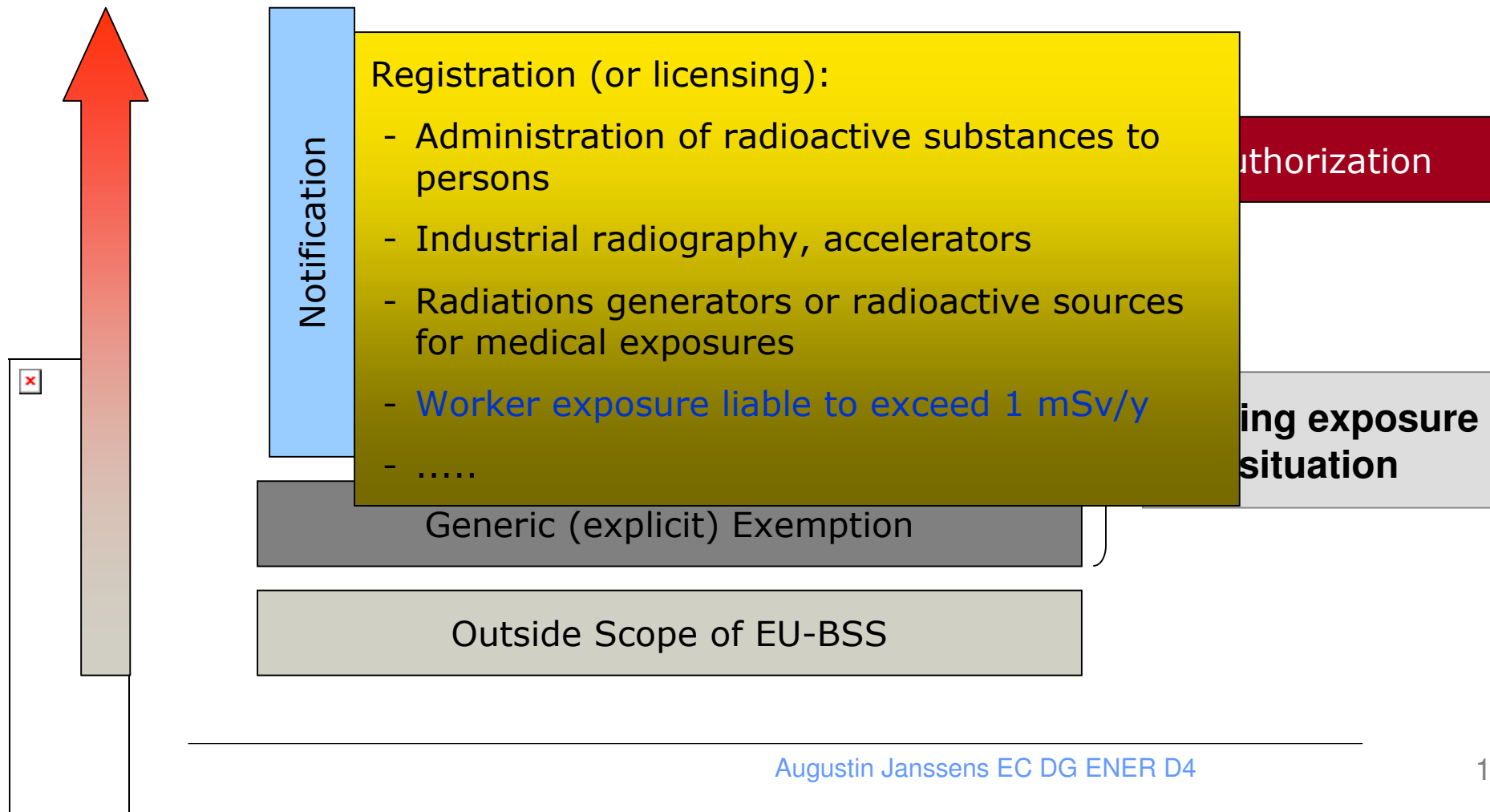
# Regulatory Control - Graded Approach



# Regulatory Control - Graded Approach



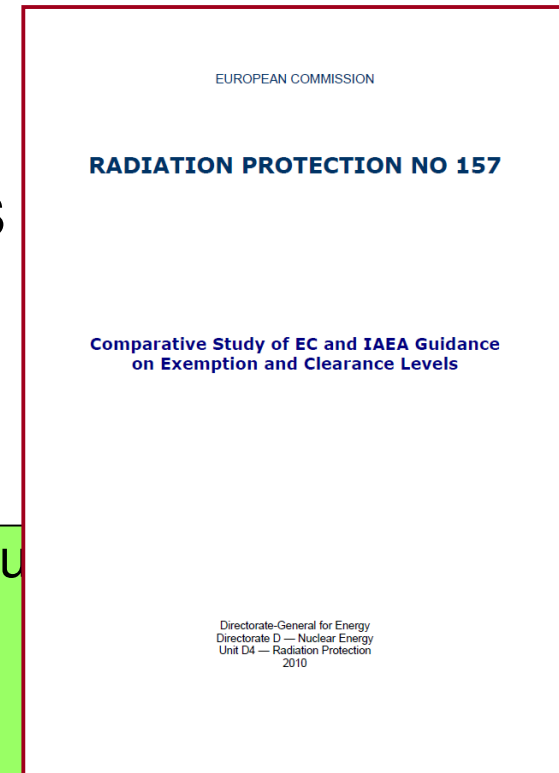
# Regulatory Control - Graded Approach



# Release from regulatory control

## Exemption and clearance

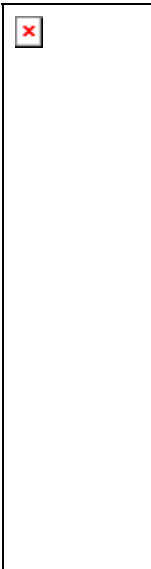
- No general clearance levels in 1996 EU-BSS (Recommendations in RP 122)
- IAEA RS-G-1.7
- Comparative Study
  - IAEA levels used as both exemption and clearance levels in revised EU-BSS
- RS-G-1.7 exempts naturally occurring radionuclide activity concentrations:
  - 1 Bq/g for U-, Th-series, 10 Bq/g for K-40
  - this does not apply in two cases:
    - Residues recycled into building materials
    - Specific risk of groundwater contamination
- EU dose criterion for clearance: 0.3 mSv per year (for NORM)



# Arrangements in Workplaces

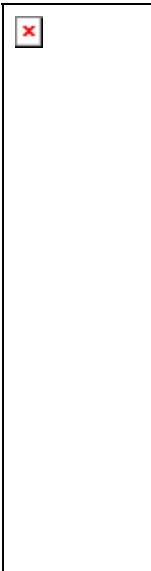
## Article 33.2

- For practices involving **naturally occurring radioactive material** where the effective dose to workers is liable to exceed **6 mSv** per year, the requirements set out in this Chapter shall apply
- Where the effective dose to workers is less than or equal to **6 mSv** per year the competent authorities shall at least require undertakings to keep exposures under review, taking into account the potential
  - for protection to be improved, or
  - for doses to increase over time or as a result of changes in the process or the work arrangements



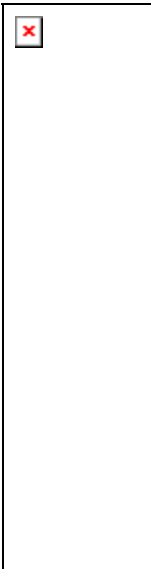
# Existing exposure situations

- Radon (workplace, dwellings)
- Building materials



# New BSS: Radon action plan

- *“Member States shall establish an action plan to manage long term risks from radon exposures in dwellings, buildings with public access and workplaces for any source of radon ingress, whether from soil, building materials and water.”*
  - Take into account issues specified in Annex XVI



# Chapter VI Protection of workers

## Radon in workplaces

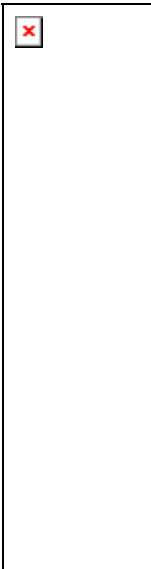
- Establishment of national reference level,
  - not exceeding 1000 Bq/m<sup>3</sup>
- Measurements necessary in
  - workplaces located at ground floor or at basement level in radon prone areas
  - specific types of workplaces identified in action plan
- Principle of optimisation
  - Reduce radon concentrations or exposures
- If levels stay above reference level despite actions
  - Manage as a planned exposure situation
  - Dose limit and requirements for occupational exposure apply





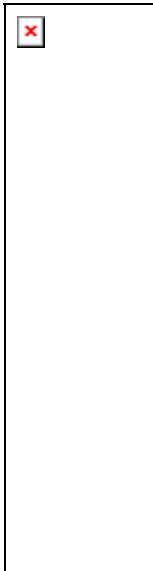
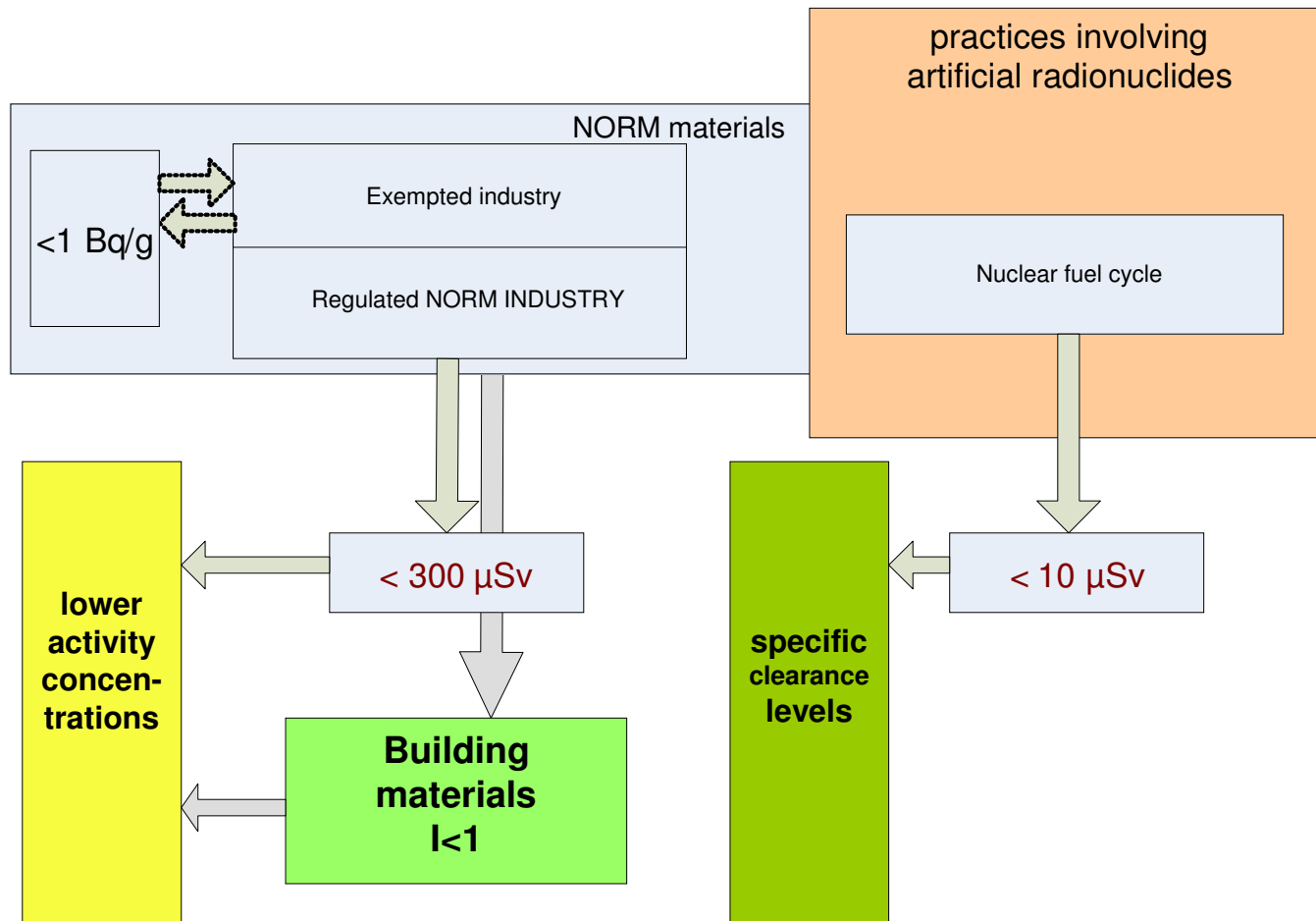
# Building materials

- 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/y the material is exempted and free on the market in EU
  - above 1 mSv/y 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
  - activity concentration index
  - two categories (reflecting whether the material is used in bulk or superficial quantities)
    - CEN/TC standards (construction products)



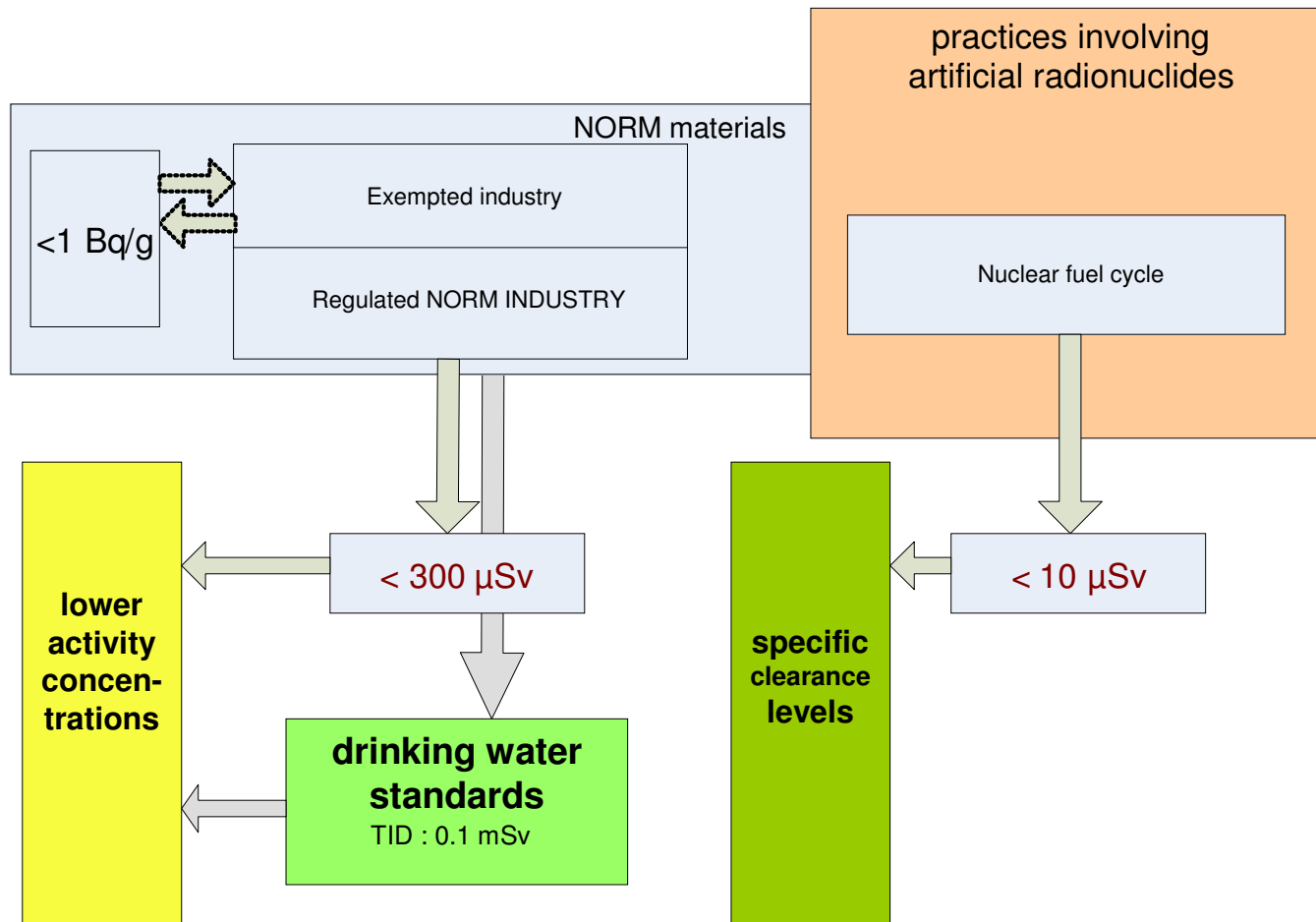
# NORM residues

## Clearance criteria



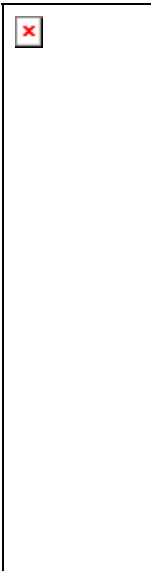
# NORM residues

## Clearance criteria



# List of types of building materials

- Natural materials
- Materials incorporating residues from NORM industries
  - Fly ash
  - Phosphogypsum
  - Phosphorus slag
  - Tin slag
  - Copper slag
  - Red mud (Aluminium production)
  - Residues from steel production



# Conclusions

- NORM industries now fully incorporated in BSS
  - Graded approach to regulatory control
- Specific provisions for exemption and clearance
  - Different approach to international standards
  - Link with management of building materials
    - mixing with other materials permitted
- Coherent approach for natural radiation sources
  - Aircrew exposure
  - Radon in the workplace
  - Occupational exposure in NORM industries

