SUNDHEDSSTYRELSEN

National legislation on decommissioning, waste management and clearance of materials, buildings and land.

NKS-B RadWorkshop 2018 on Radioanalytical Chemistry for Nuclear Decommissioning and Waste Management

DTU Risø Campus, Roskilde, Denmark 8-12 October 2018.

08. October 2018
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Danish Health Authority

Overview

- Basis for radiation protection legislation

- New danish legislation on radiation protection
  - hierarchy of authorisation
  - provisions for waste management, decommissioning and clearance

- Decommissoning of the nuclear facilities in Denmark

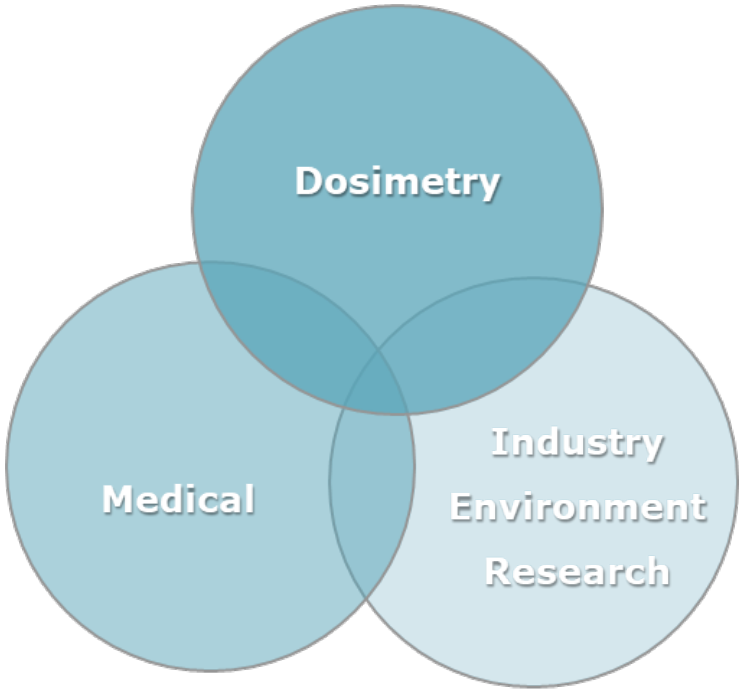
- Conclusions

Danish Health Authority, Radiation Protection (SIS)

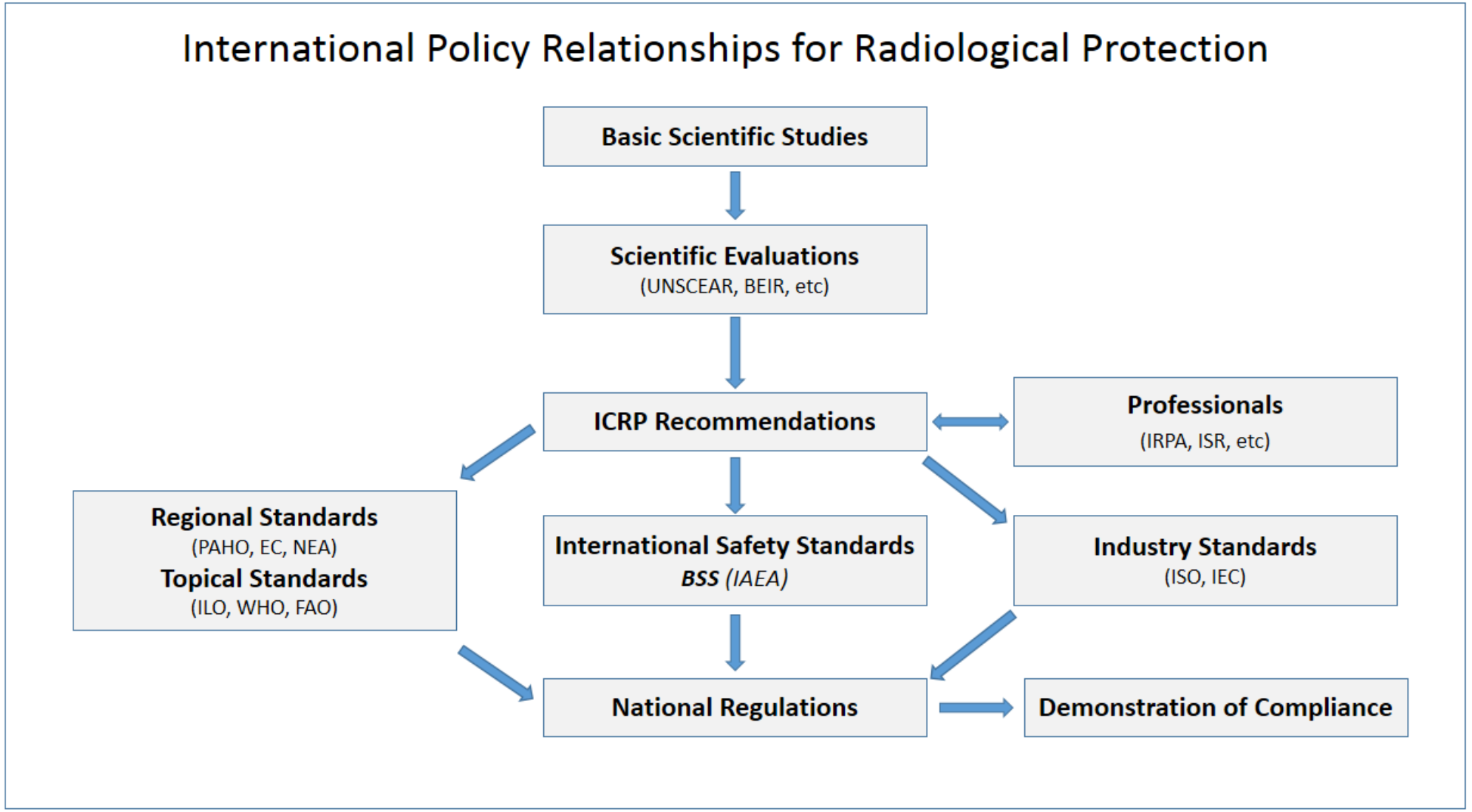
Danish national authority on radiation protection

- SIS regulates the use of ionizing radiation and radioactive substances in Denmark in order to protect humans and the environment against the harmful effects of ionizing radiation.

- 38 Employees
- Head of unit
- 30 Subject matter experts
- 3 Lab technicians
- 4 Administrative staff



Basis for radiation protection legislation

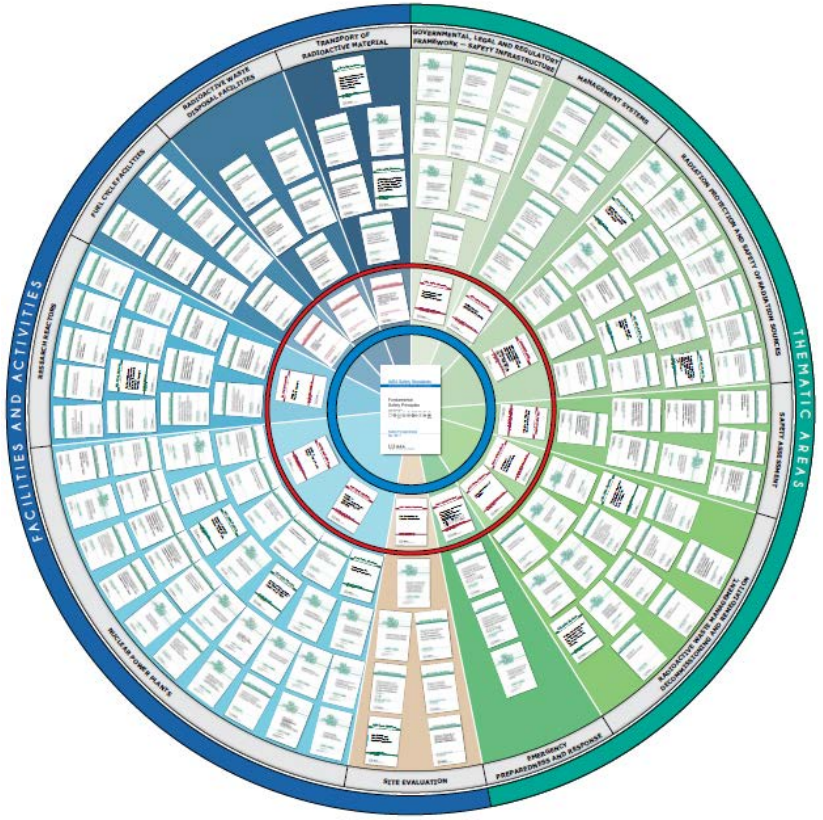


IAEA safety standards

A global frame of reference for radiation protection and safety

- IAEA safety standards and EU legislation display a high degree of coherence

- Significant internationally recognized conventions on nuclear safety and waste management are mirrored in EU directives, and as such, IAEA guidance leaves a clear mark on national legislative provisions in EU member states.



European Union - Euratom

Euratom-treaty
Treaty from 1957 on the formation of a european atomic energy community, aimed at promoting the safe and peaceful use of atomic energy

Article 2, b:
"…. establish uniform safety standards to protect the health of workers and of the general public and ensure that they are applied …"

European Union - Directives

Directives related to radiation protection, waste management and nuclear safety

- Council Directive 2013/ 59/ Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation. (EU BSS)
- Council Directive 2011/ 70/ Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (Waste management directive)
- Council Directive 2009/ 71/ Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations (Nuclear safety directive)

The EU-BSS was implemented in Denmark on 06 February 2018, and together with the other directives provides the basis for ensuring

"...the protection of the health of workers and the general public against the dangers arising from ionizing radiation."

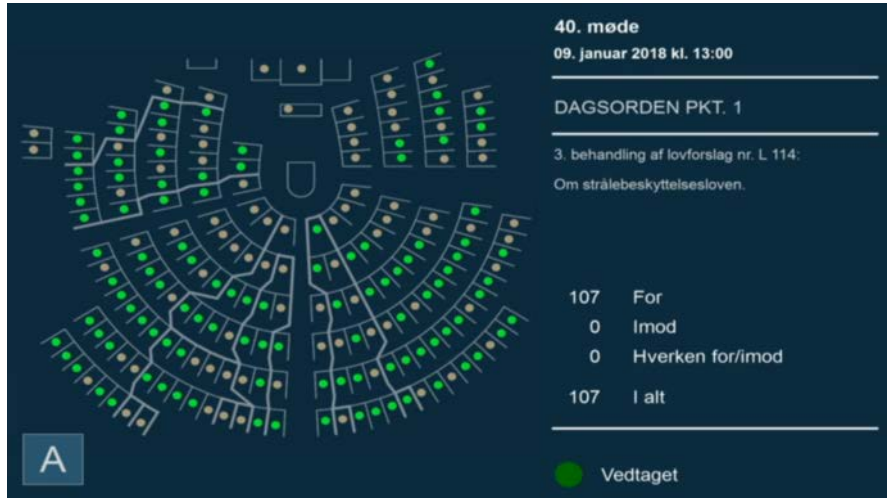
New Danish legislation on radiation protection

- Law on ionizing radiation and radiation protection

Lov om ioniserende stråling og strålebeskyttelse, nr. 23 af 15. januar 2018

Replaces

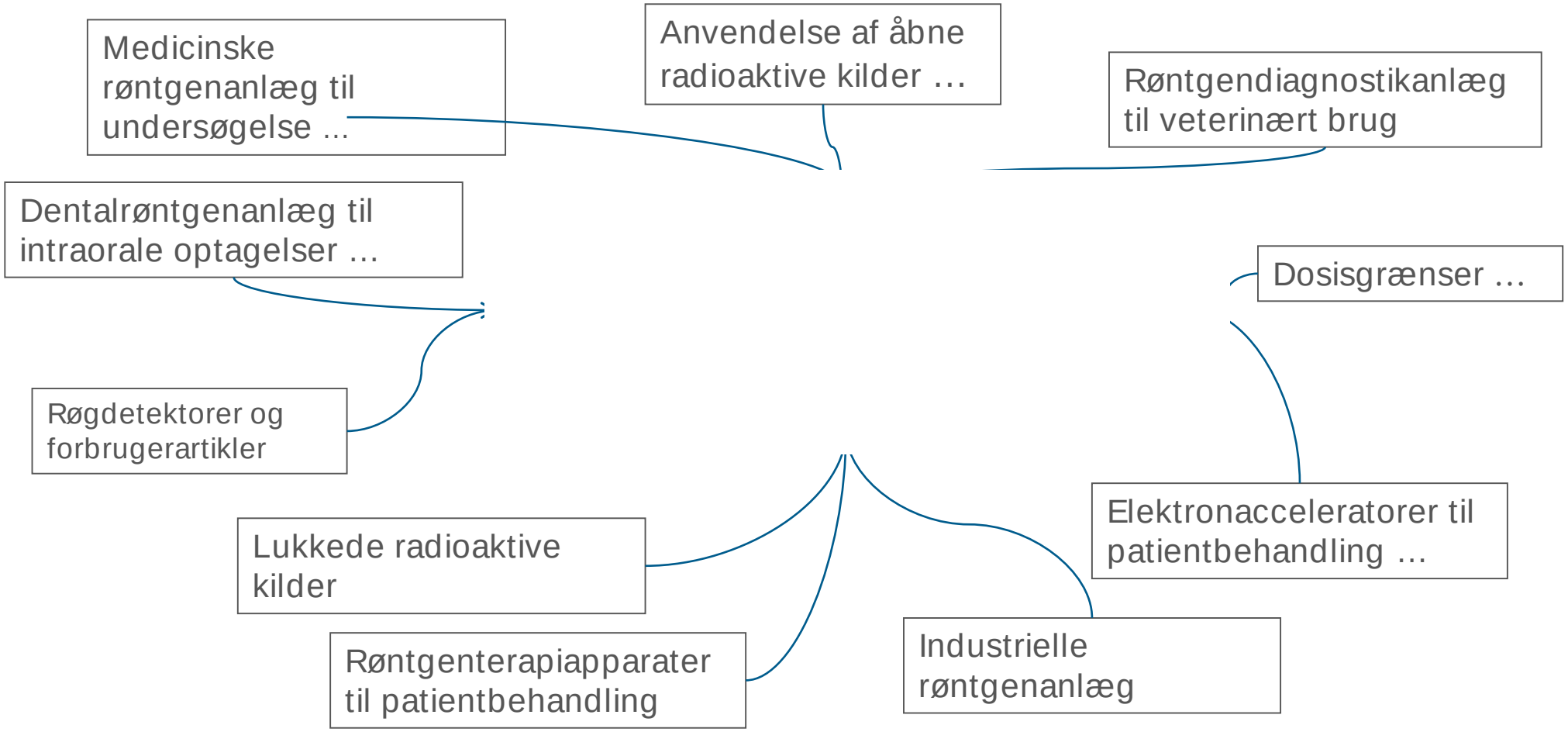
- Lov om brugen af røntgenstråler m.v. from 1930
- Lov om brug m.v. af radioaktive stoffer from 1953



- Introduces specific clearance levels (activities and concentrations)

New regulations – orders (bekendtgørelser)

17 orders condensed into 3



Hierarchy of authorization

– License

General requirement

- Licensee must perform a Safety Assessement

– Notification

For most uses of x-ray in dental and veterinary applications

For low concentrations and amounts of radioactive materials (exept where administered to patients)

– Exemption

Where no radiation protection measures are required

For radioactive materials: amounts of activity and concentrations

Hierarchy of authorization – ”basic units”: Specific exemption and clearance levels

Unrestricted amounts - concentrations

Radionuklid	Aktivitetskoncentration [kBq/kg]
H-3	100
Be-7	10
C-14	1
F-18	10
Na-22	0,1
	1
	1.000

Limited amounts – concentrations and activity

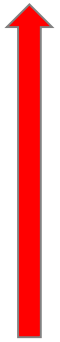
Radionuklid	Aktivitetskoncentration [kBq/kg]	Aktivitet [Bq]
H-3	1×10^6	1×10^9
Be-7	1×10^3	1×10^7
C-11*	1×10^1	1×10^6
C-14	1×10^4	1×10^7
N-13*	1×10^2	1×10^9
O-15	1×10^2	1×10^9
F-18	1×10^1	1×10^6

$$\sum_{k} \frac{C_k}{C_{U,k}} \leq 1$$

Licencing scheme – use of radioactive materials

Myndighedskontrolniveau for åbne radioaktive kilder		Samlet aktivitet, A [Bq], i virksomhedens besiddelse samtidigt		
		$A \leq$ bilag 3	bilag 3 $< A \leq$ (10 · bilag 3)	(10 · bilag 3) $< A$
Aktivitets-koncentration, AK [kBq/kg]	(1.000 · bilag 3) $< AK$	Tilladelse	Tilladelse	Tilladelse
	bilag 3 $< AK \leq$ (1.000 · bilag 3)	Underretning	Tilladelse	Tilladelse
	bilag 4 $< AK \leq$ bilag 3	Undtaget fra krav om underretning	Underretning	Tilladelse

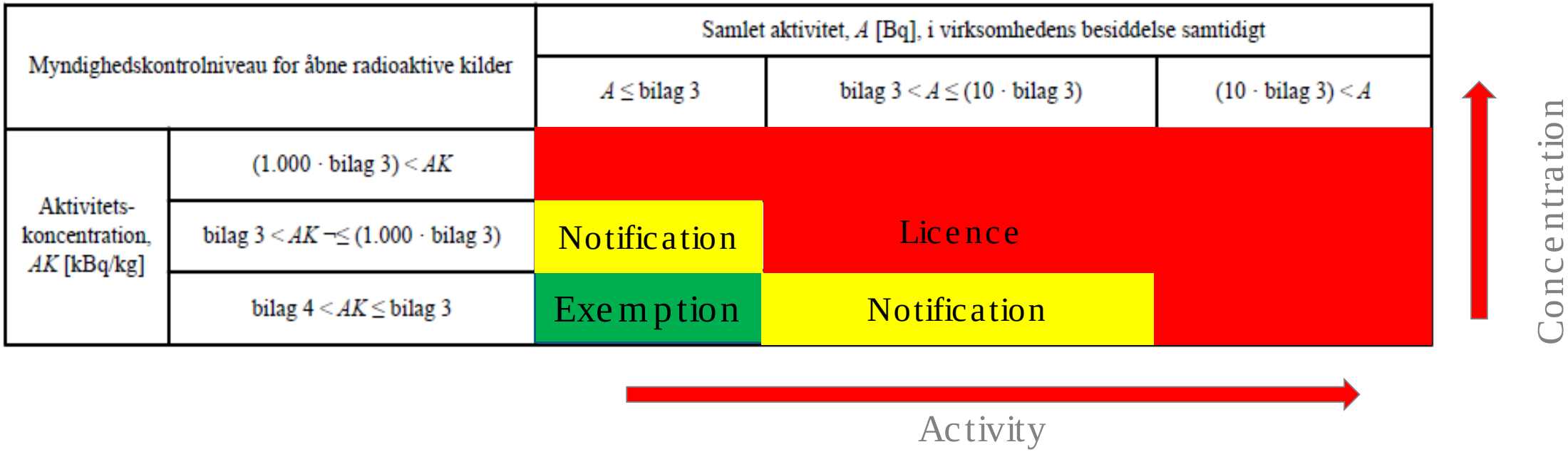
Activity



Concentration

Applies to total amount of activity of unsealed radioactive sources possessed by license holder at any given time

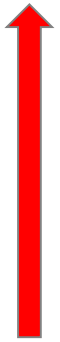
Licencing scheme – use of radioactive material



Licencing scheme – radioactive waste management

Myndighedskontrolniveau for åbne radioaktive kilder		Samlet aktivitet, A [Bq], der må bortskaffes pr. måned		
		$A \leq$ bilag 3	bilag 3 $< A \leq$ (10 · bilag 3)	(10 · bilag 3) $< A$
Aktivitets-koncentration, AK [kBq/kg]	(100 · bilag 3) $< AK$	Tilladelse	Tilladelse	Tilladelse
	bilag 3 $< AK \leq$ (100 · bilag 3)	Underretning	Tilladelse	Tilladelse
	bilag 4 $< AK \leq$ bilag 3	Undtaget fra krav om underretning	Underretning	Tilladelse

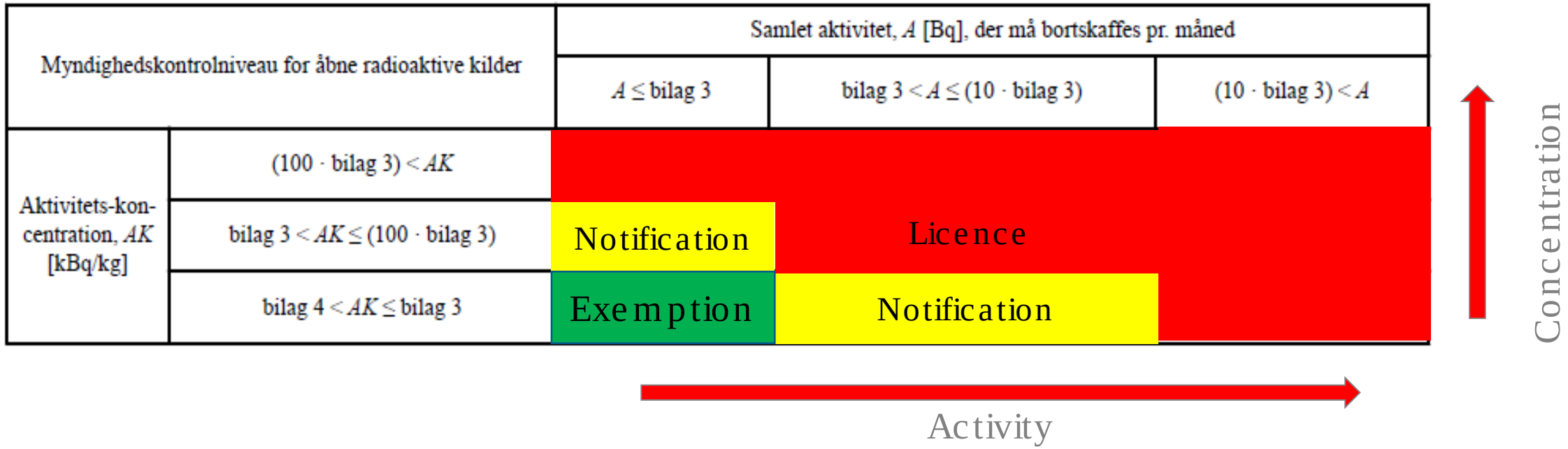
Activity



Concentration

- Applies to radioactive waste; material with no further anticipated use
- Limits the total amount of activity of radioactive waste to be disposed of in **a month**

Licencing scheme – radioactive waste management



Licencing – role of safety assessment

Licence for use ?

Licence for waste ?

Activity, concentration
Any point in time

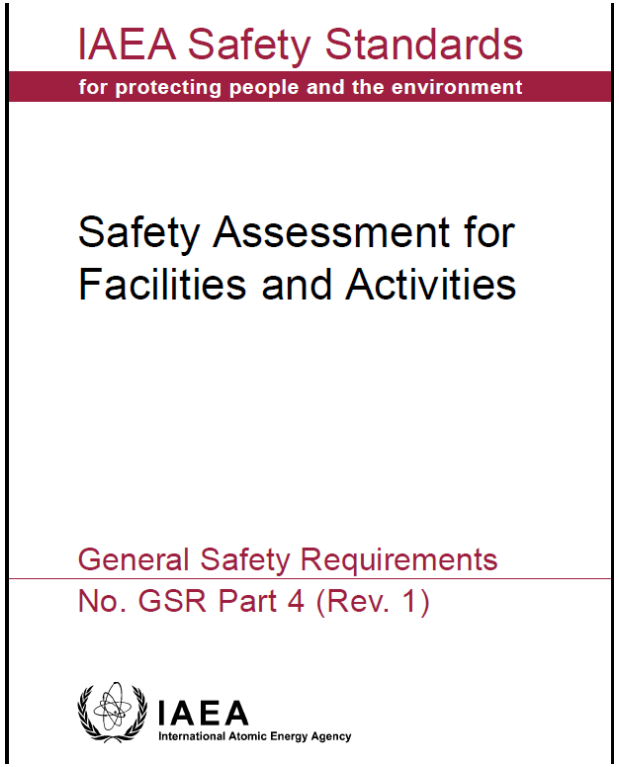
Activity, concentration
Per month

Safety Assessment

Order no. 84 on ionizing radiation and radiation protection:

§12 Before any use or exposure subject to requirements for licensing, the licensee must undertake a safety assessment [..]. taking the application of a graded approach into account.

Safety assessment:
Assessment of all aspects relevant for protection and safety



Radioactive waste management

- Notification

Physical form	Disposal route	Requirement
Solid	Industrial incineration	Dose rate on package < 5 µSv/ h
Liquid	Sewer discharge	Activitiy concentration less than exemption level for limited amounts
Gaseous	Atmospheric discharge	Activitiy concentration less than exemption level for limited amounts

Radioactive waste management

- Licensing

Physical form	Disposal route	Requirement
Solid	Disposal (near surface/ geological repository – as appropriate), incineration, decay storage	Subject to conditions, based on dose constraint and safety assessement
Liquid	Sewer discharge, decay storage, transform to solid form for management accordingly	Subject to conditions, based on dose constraint and safety assessement
Gaseous	Atmospheric discharge, decay storage, transform to liquid or solid form for management accordingly	Subject to conditions, based on dose constraint and safety assessement

- Further provisions regarding keeping of inventories, storage facilities, minimization of waste, etc.
- Decay storage only allowed for 1 year before transfer to national waste management operator, Danish Decommissioning.

Exemption and clearance - materials

Order no. 85 on use of radioactive materials:

Annex 2: Generic clearance and exemption criteria:

- The radiological risks are sufficiently low, as to be of no regulatory concern
- The type of practice has been determined to be justified
- The practice is inherently safe.
- The effective dose expected to be incurred by a member of the public is of the order of 10 µSv or less in a year, concerning artificial radionuclides, and 1 mSv or less in a year concerning naturally occurring radionuclides.

When activity amounts and activity concentrations are below specific clearance values, clearance and exemption criteria are deemed satisfied.

§ 10

- When documenting compliance with clearance criteria, averages over amounts of one metric tonne are permitted.
- Identified sub-parts of materials with activity concentrations above clearance levels must be separated if reasonably achievable.

Exemption and clearance – buildings and land

Order no. 85 on use of radioactive materials:

§ 11 and annex 5

- Buildings and equipment may be release from regulatory control if surface-specific activity concentrations averaged over 1 m^2 and calculated as the total activity on and below the surface divided by the area, are less than the values given in annex 5.
- Distinctions made between clearance made for other uses of radioactive substances or for unrestricted use.

§ 12

- Release of sites from regulatory control if the effective dose expected to be incurred by a member of the public is of the order of 10 µSv or less in a year.

Decommissoning of the nuclear facilities in Denmark
Danish Decommissioning

- Since 2003 tasked with the undertaking of dismantling the Danish nuclear facilities at Risø, including research reactors, hotcells, fuel fabrication and waste management facilities.
- Parliamentary decision to achieve “green field”

- Nuclear facility – legal basis for decommissioning
  Regulated through the “atomic facilities act”, imposing the condition that Danish Decommissioning undertake all tasks in accordance all relevant legislative requirements and according to additional conditions set by regulatory authority in “Operational Limits and Conditions for Danish Decommisioning”

Operational Limits and Conditions - Framework

- Decommissioning must progress according to an overall decommissioning plan approved by the regulatory authorities.

- All safety related documentation related to operations and decommissioning must be developed with reference to relevant IAEA guidance, (e.g. SSG-20, Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report, WS-G-2.1, Decommissioning of Nuclear Power Plants and Research Reactors etc). and is to be regularly reviewed and updated.

- Specific decommissioning projects must be detailed with reference to relevant IAEA guidance, (e.g. WS-G-2.1, Decommissioning of Nuclear Power Plants and Research Reactors) and must include all relevant components of a safety assessment for such undertakings.

Operational Limits and Conditions – Discharge

- Nuclide specific discharge limits have been derived for individual facilities (buildings or groups of buildings) corresponding to a dose constraint of 50 µSv per year, and for all facilities combined, corresponding to a dose constraint of 100 µSv per year.

- Annual reporting cycles as well as reporting levels for extraordinary discharge situations form part of the demonstration of compliance

Operational Limits and Conditions – Clearance

- Danish Decommissioning maintains a dedicated Clearance Laboratory for decommissioning waste which upholds an independent accreditation (ISO/ IEC 17025:2008), enabling clearance tasks with no restrictions on the amount or type of decommissioning waste.

- For mass specific clearance levels, the Clearance Laboratory refers to IAEA safety Guide No. RS-G-1.7, Application of the Concepts of Exclusion, Exemption and Clearance

- Clearance of buildings is made with reference to EC publication Radiation Protection 113, Recommended radiological protection criteria for the clearance of buildings and building rubble from the dismantling of nuclear installations, 2000.

Operational Limits and Conditions – Waste management

- Radioactive waste categorization must follow IAEA General Safety Guide GSG-1, Classification of Radioactive Waste

- Waste management and storage must be organized with reference to IAEA Safety Requirements No. WS-R-2, Predisposal Management of Radioactive Waste Including Decommissioning.

  Further details on waste management principles and procedures (waste minimization, waste streams etc), are provided in “Operational limits and conditions”.

Beyond decommissioning – Parliamentary resolution B90

On May 15, 2018, the Danish Parliament adopted resolution B90 solution on a long-term solution for Denmark's radioactive waste.

Through this, the Danish Parliament notified its consent for the Government to implement a solution for Denmark's radioactive waste with the objective of upgrading the Danish Decommissioning storage facilities at the Risø peninsula and to prepare the localisation and implementation of a deep geological final repository to be in operation by 2073 at the latest.

Conclusions

- Revised Danish legislation on radiation protection provides specific as well as generic exemption and clearance criteria for materials, buildings and land, and includes provisions for decommissioning, radioactive waste management and clearance

- The licensing regime operates on the “basic units” of exemption and clearance levels and specifies the requirement for licensees to conduct safety assessments.

- As national waste management operator, Danish Decommissioning is subject to the same basic legal requirements regarding decommissioning, radioactive waste management and clearance as other licensees, but operates according to limits and conditions derived on the basis of safety assessments.