Dose reduction below de minimis level?

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For what purpose?

Example: Decommissioning of a NPP:

Total mass: 100.000 Mg

radioactive waste: 3.000 Mg

mass for clearance: 97.000 Mg

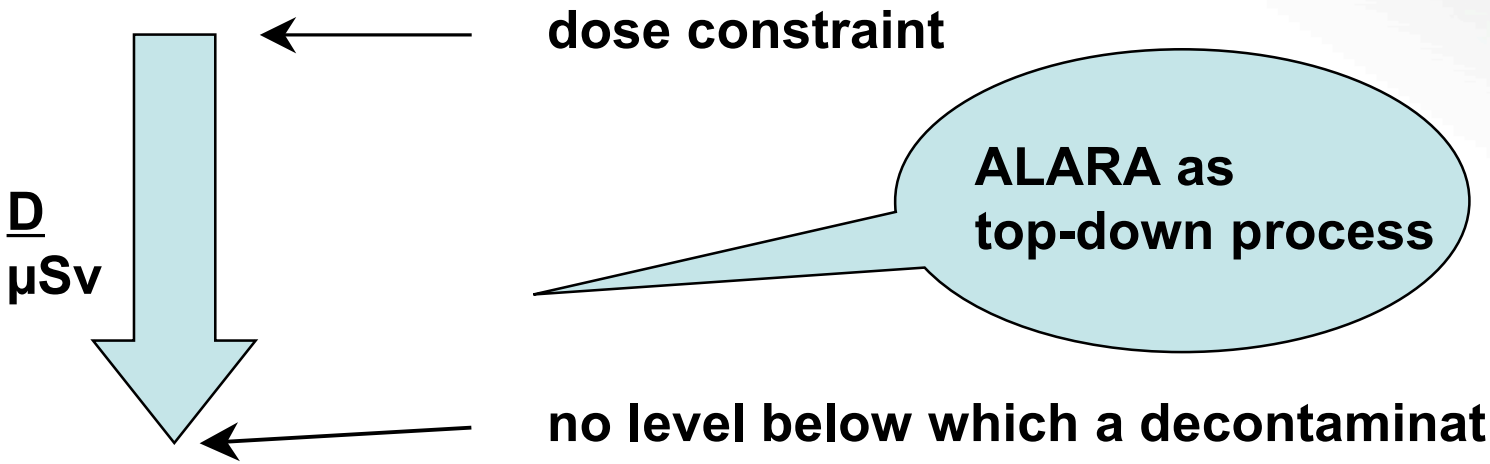
(general and specific clearance)

⇒ decontamination of materials is decisive!

⇒ Is the clearance level an appropriate decision level for a sufficient decontamination?

The ALARA Principle

In case of contamination the resulting radiation exposure should be as low as reasonably achievable taking economic and societal factors into account.



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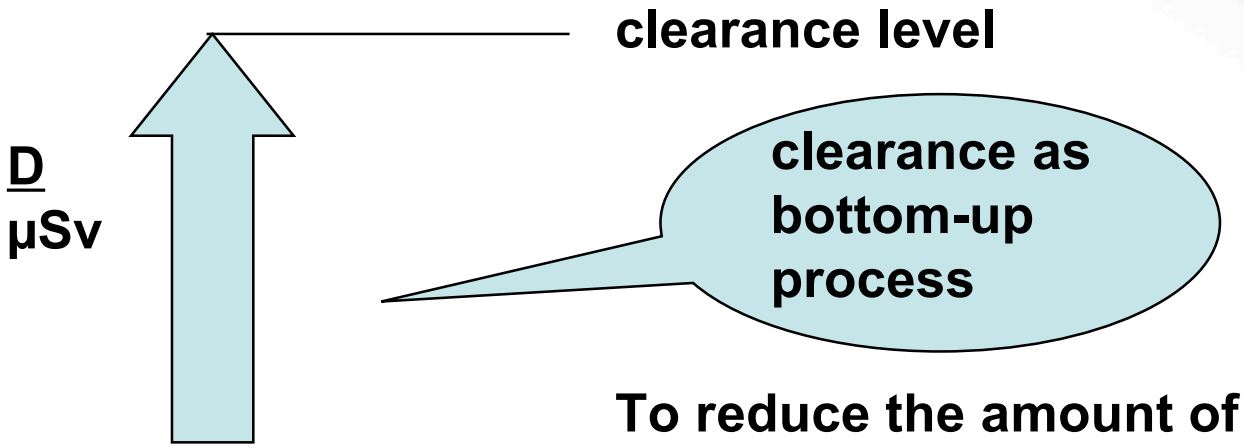
de minimis concept

A level of an individual dose of some tens of microsievert in a year could be reasonably regarded as trivial



To reduce the amount of radioactive waste a maximum of material for clearance has to be achieved.

=>max out of dose limit

Case study
Contamination of 500 Bq Beta-/Gamma emitters or 50 Bq Alpha emitters on a surface of 1m²

1. spot
2. small area
3. total contaminated

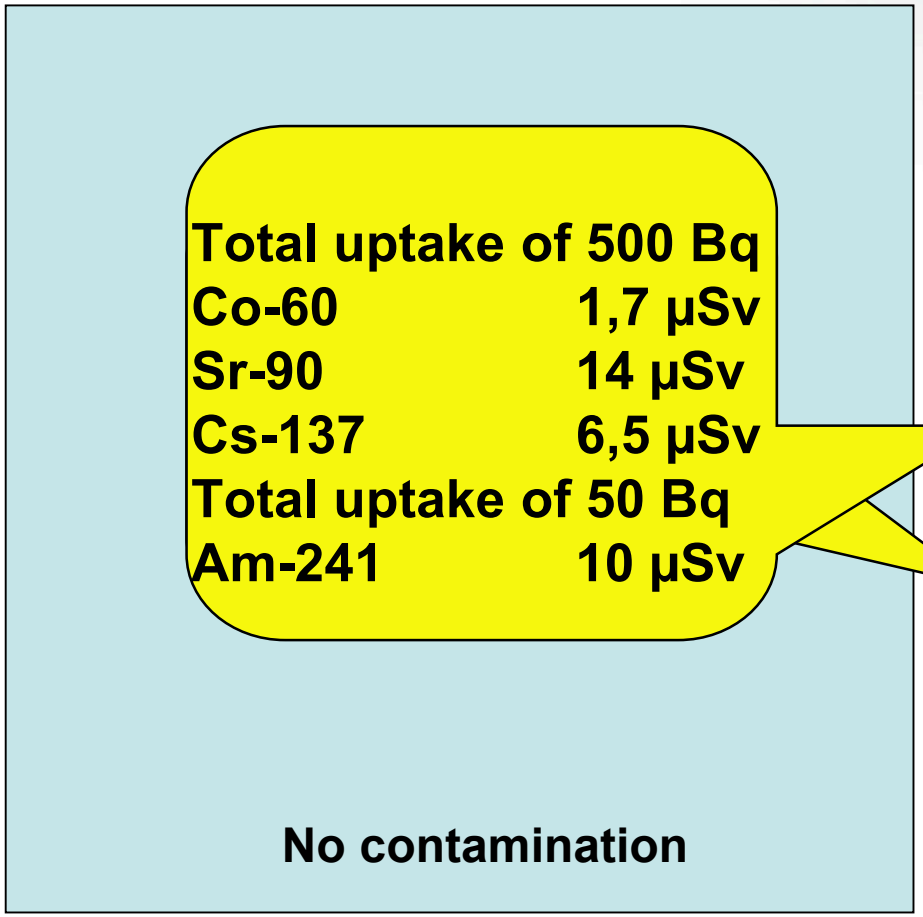
Surface specific clearance value in Germany for

- Co-60, Cs-137, Sr-90 1 Bq/cm²
- Am-241 0,1 Bq/cm²

average area 1000 cm²

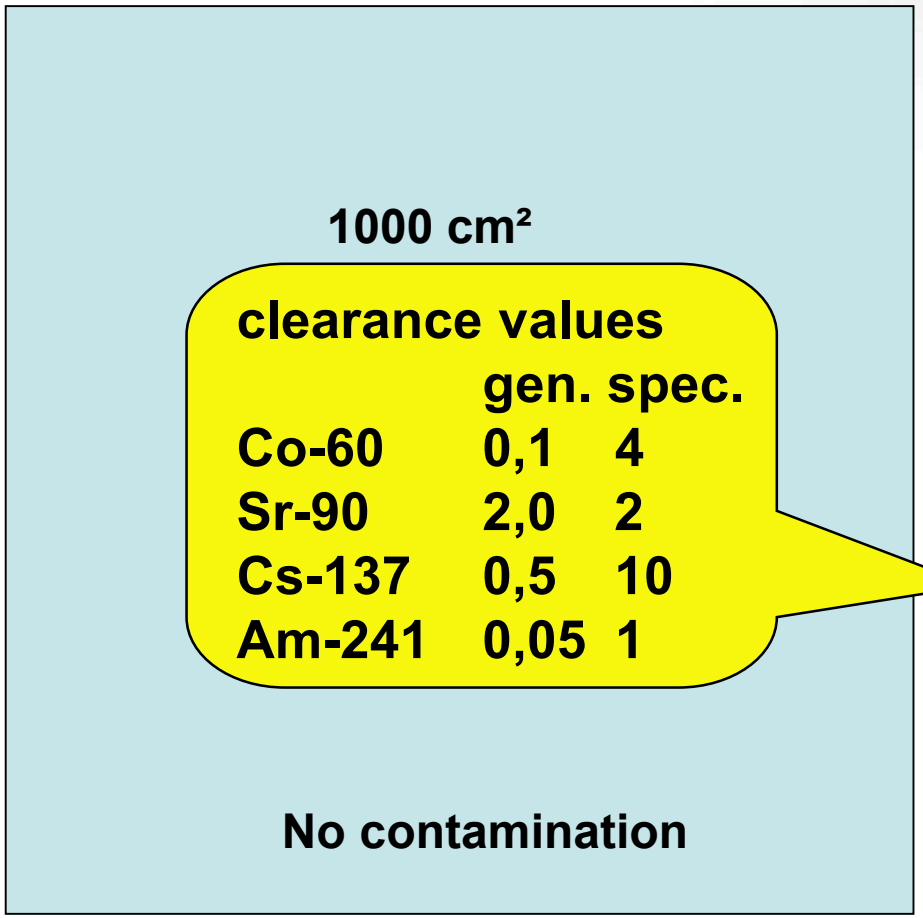
=> 50% of permitted contamination in case of clearance

Contamination of 500 Bq on a surface of 1m²



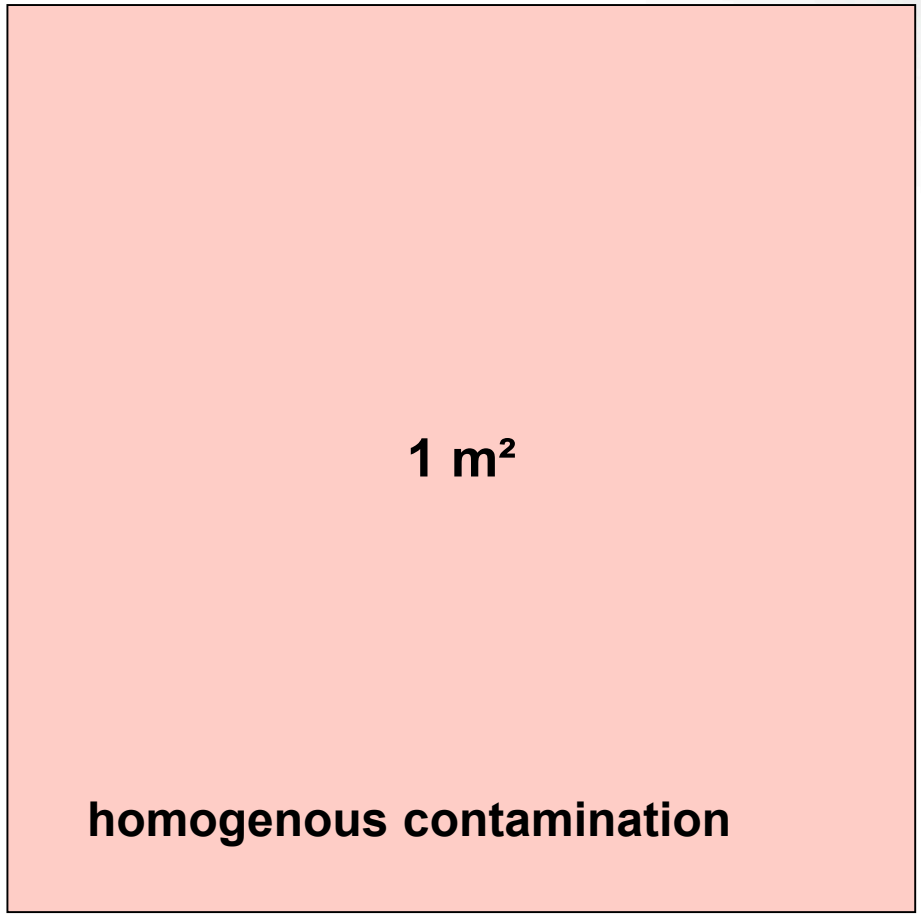
- 500 Bq/cm²
- easy to detect if you find it
- easy for decontamination
- high risk of incorporation
- approx. 20 Bq/g for secondary waste
- secondary waste is radioactive waste

Contamination of 500 Bq on a surface of 1m²



- 0.5 Bq/cm²
- clear detectable
- easy to find
- possible for decontamination,
- low risk of incorporation
- approx. 0,5 Bq/g for secondary waste (1 kg)
- secondary waste for clearance
- decontamination not reasonable

Contamination of 500 Bq on a surface of 1m²



- 0.05 Bq/cm²
- not detectable
- impossible to find
- no decontamination
- no risk of incorporation
- no secondary waste

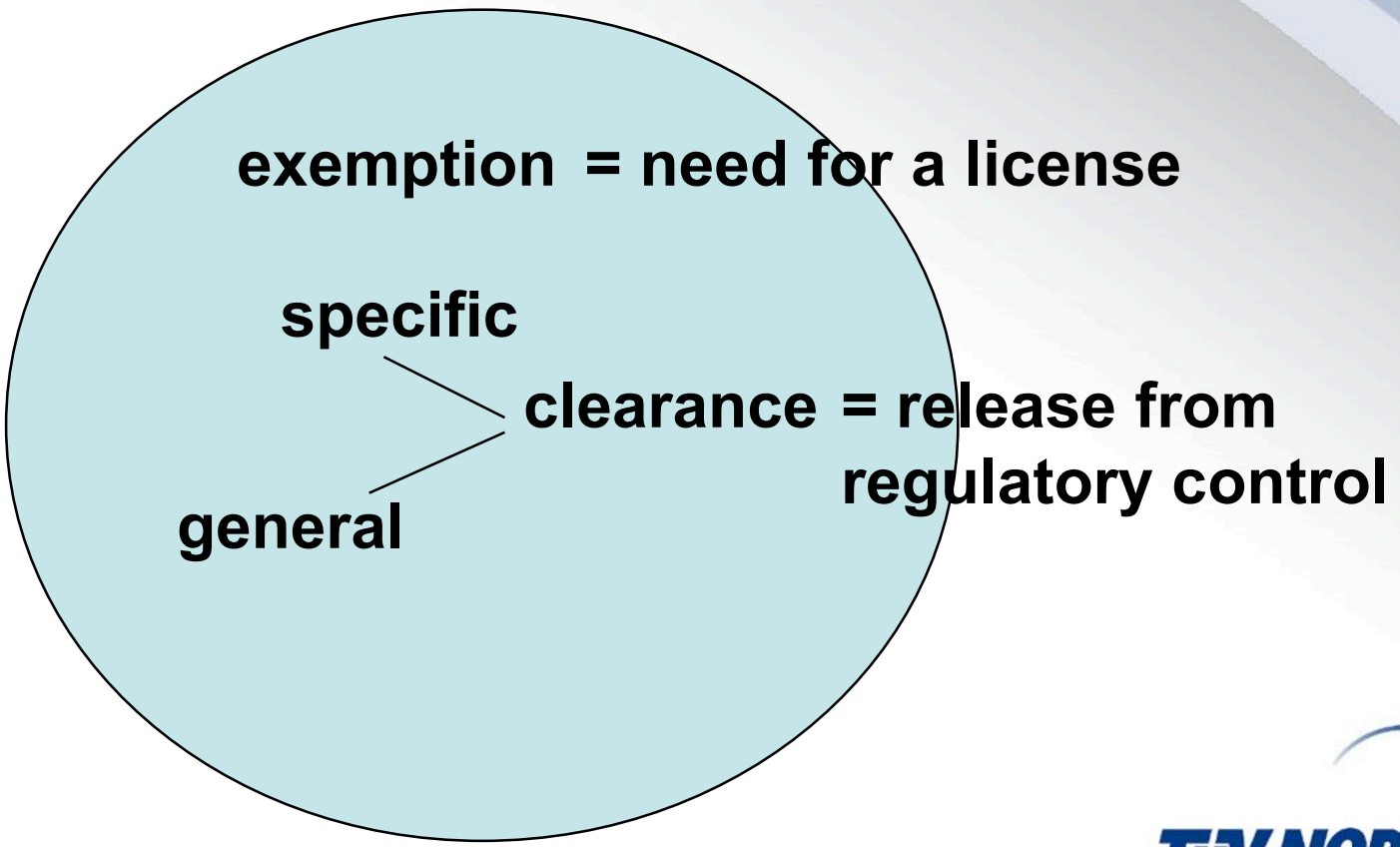
Decision guide for decontamination

Activity of secondary waste < clearance level

⇒decontamination process is finished

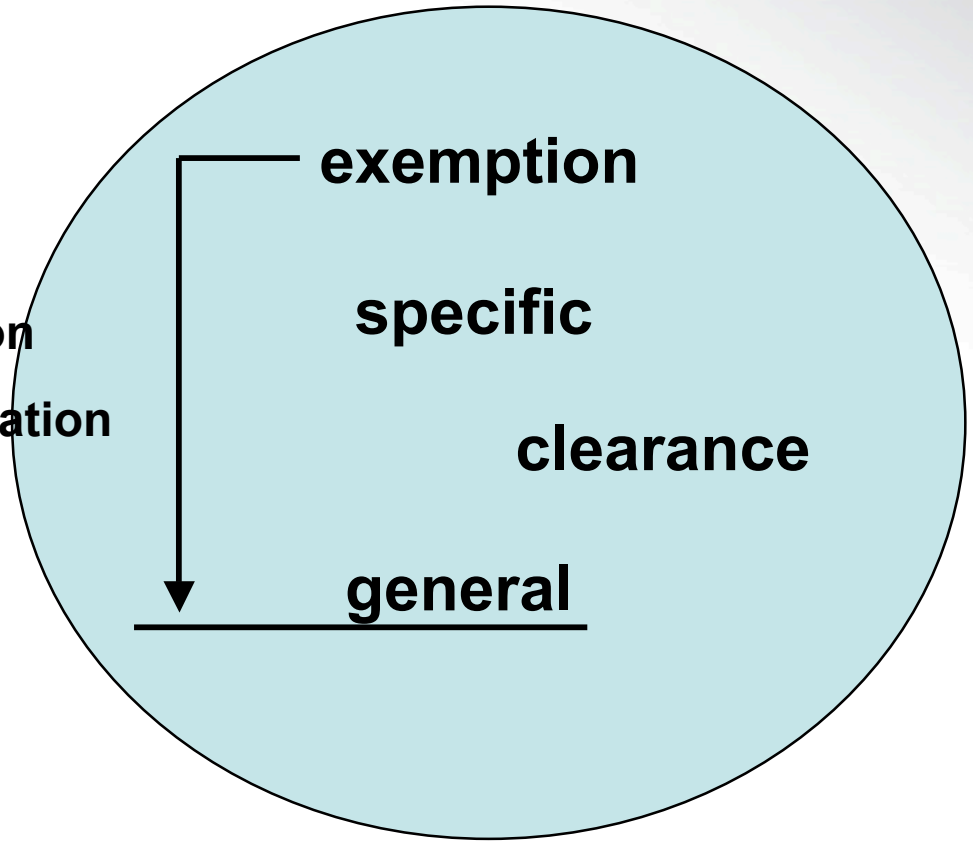
Decision guide for the extention of decontamination processes in case of decontamination for clearance

Perspective of clearance values



exemption values > clearance values

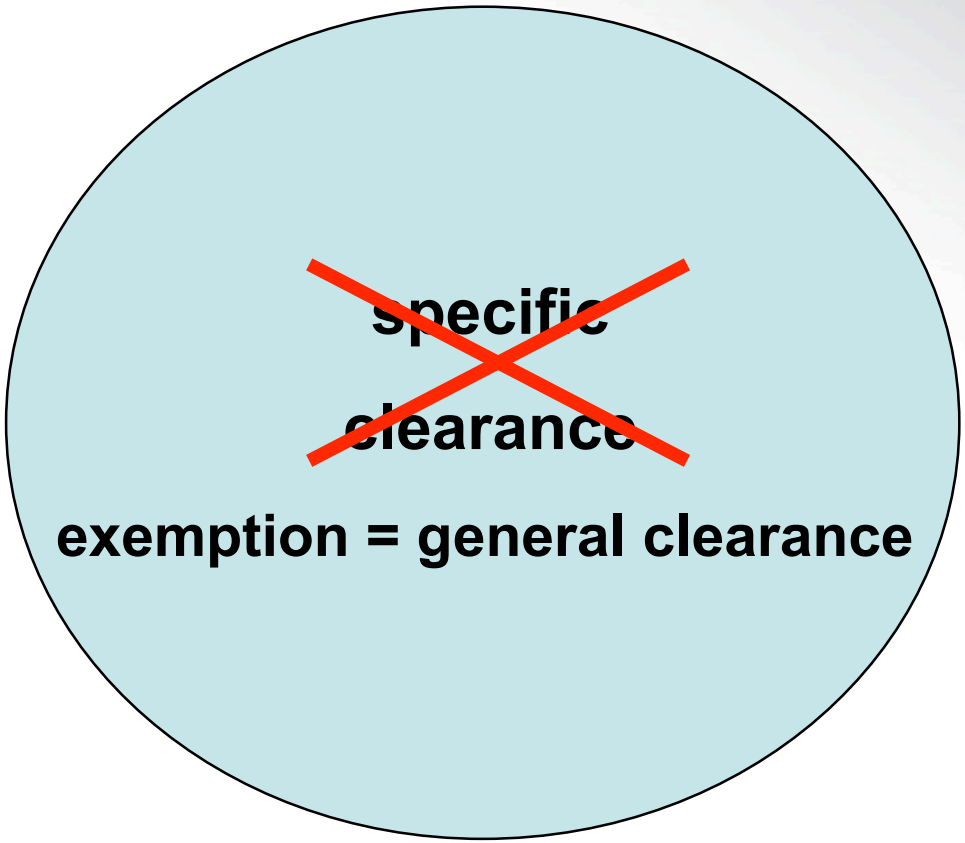
Perspective of clearance values



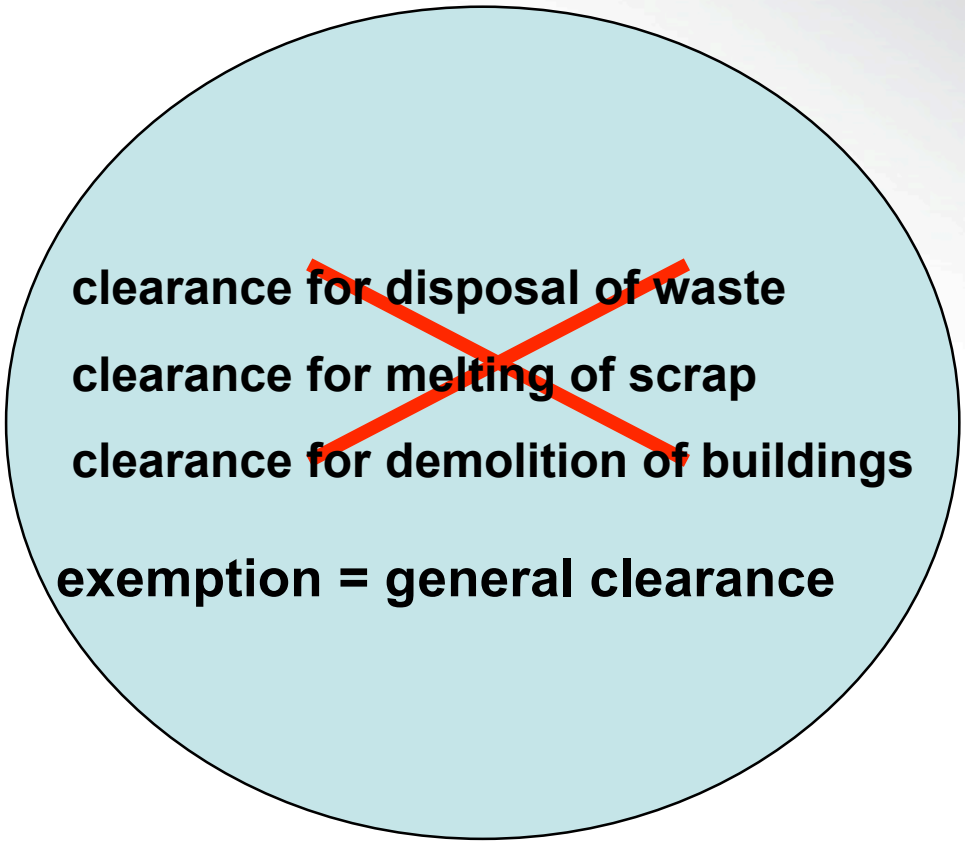
Harmonisation

and Simplification

Perspective of clearance values



Perspective of clearance values



defined in next BSS of IAEA and EU

Mass balance for decommissioning projects

plant	Mass/Mg	General clearance	Recycling, reuse	Disposal, demolition	Radioactive waste
KKS actual total mass	11.734 Mg 100% 101.353 Mg	3.763 Mg 32%	2.852 Mg 24,3%	2.830 Mg 24,1%	2.289 Mg 19,6%
KWW actual	25.867 Mg	15.230 Mg 58,9%	5.250 Mg 20,3%	1.840 Mg 7,1%	3.547 Mg 13,7%
EWN total actual	565.000 Mg 172.647 Mg	27.770 Mg 16%	13.472 Mg 8%	126.273 Mg 73%	5131 Mg 3%

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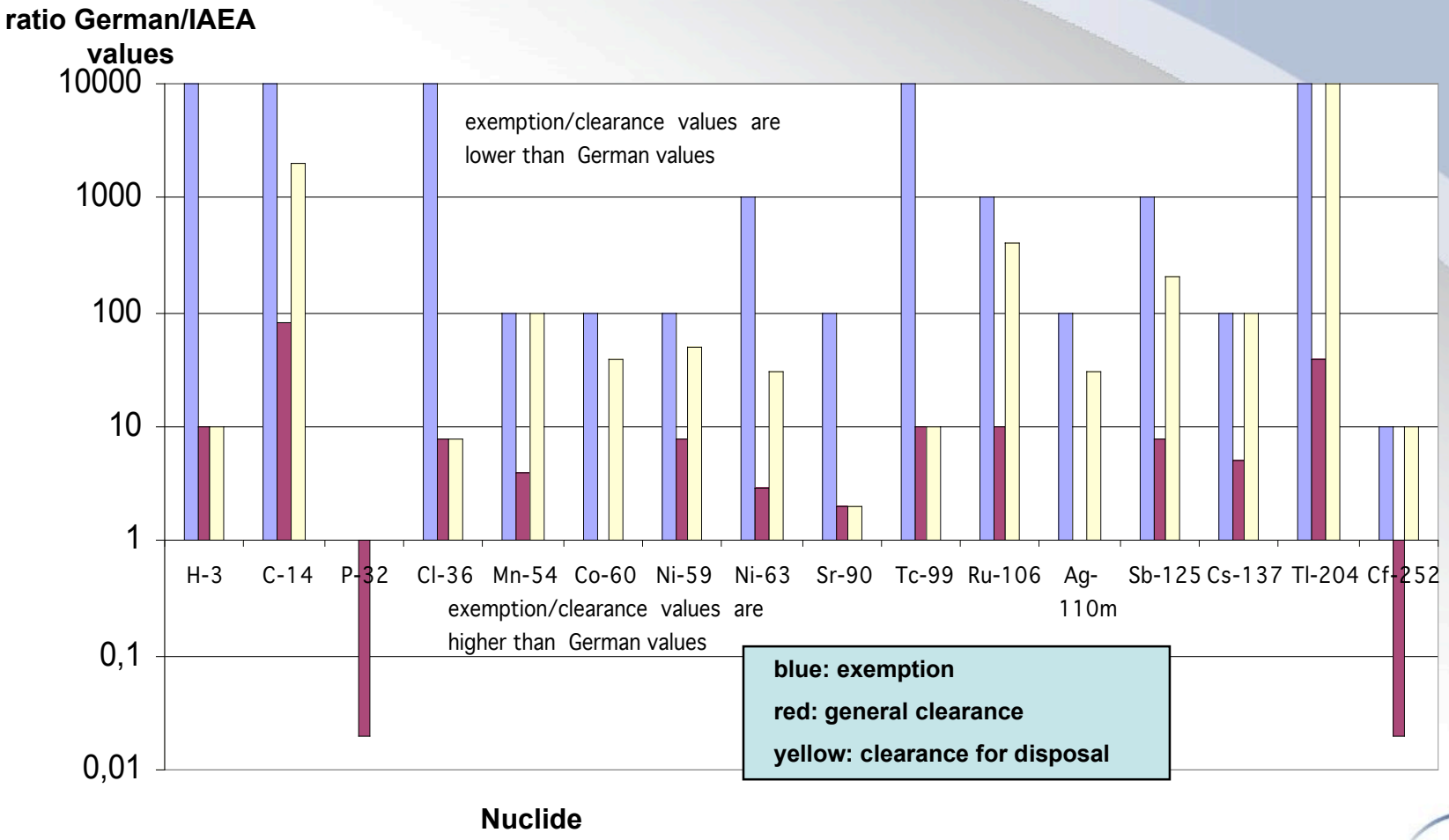
Comparison of German clearance values to IAEA RS-G-1.7 values



Results

If the values for specific clearance will be abandoned, the effort for decontamination during the decommissioning of nuclear installations will rise enormously.

=> Therefore, the dose for workers will also rise.

=> The planned reduction of clearance values is in opposition to the ALARA Principle.

Conclusions

1. In the case of decommissioning of nuclear installations the ALARA Principle and the de minimis concept are contradictory.
2. A simple guide is given to find a level for finishing the decontamination process.
3. In case of reducing the exemption levels on the basis of the values of the general clearance values of the IAEA not only the amount of radioactive waste will rise very strongly but also the dose of the workers will increase.

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