

Perspective of Clearance Values - Impacts on Decommissioning Projects

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**Exemption and Clearance – Two different procedures?
IAEA Safety Guide RS-G-1.7
Application of the Concepts of Exclusion,
Exemption and Clearance**

Only one system of limits for clearance, exemption and exclusion on the basis of the de minimis concept,

but not for foodstuffs, drinking water and any material intended for use in food or animal feed, radon, potassium-40.

IAEA Safety Guide RS-G-1.7

Application of the Concepts of Exclusion, Exemption and Clearance

Advantages:

an easier understanding and therefore a better acceptance by the users,

easier to control,

a good basis for an international harmonisation.

Int. BSS=>Eur. BSS=>Nat. Rad.Prot.Ord.

Revision of the International Basic Safety Standards for Radiation Protection by IAEA

TABLE I-1. EXEMPTION AND CLEARANCE LEVELS

Radionuclide	Activity for exemption of material in a practice, including material in transport (Bq)	Activity concentration for exemption of material (a) in a practice in a quantity of the order of 1 t or less or (b) in transport irrespective of quantity (Bq/g)	Activity concentration of material, irrespective of quantity, for (a) exemption in a practice or (b) clearance from a practice ¹ , (Bq/g)
H-3	1×10^9	1×10^6	1×10^2
Be-10	1×10^6	1×10^4	—
Be-7	1×10^7	1×10^3	1×10^1
C-11	1×10^6	1×10^1	—
C-14	1×10^7	1×10^4	1×10^0

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Application of the Concepts of Exclusion, Exemption and Clearance

Disadvantages (only from the view of clearance):

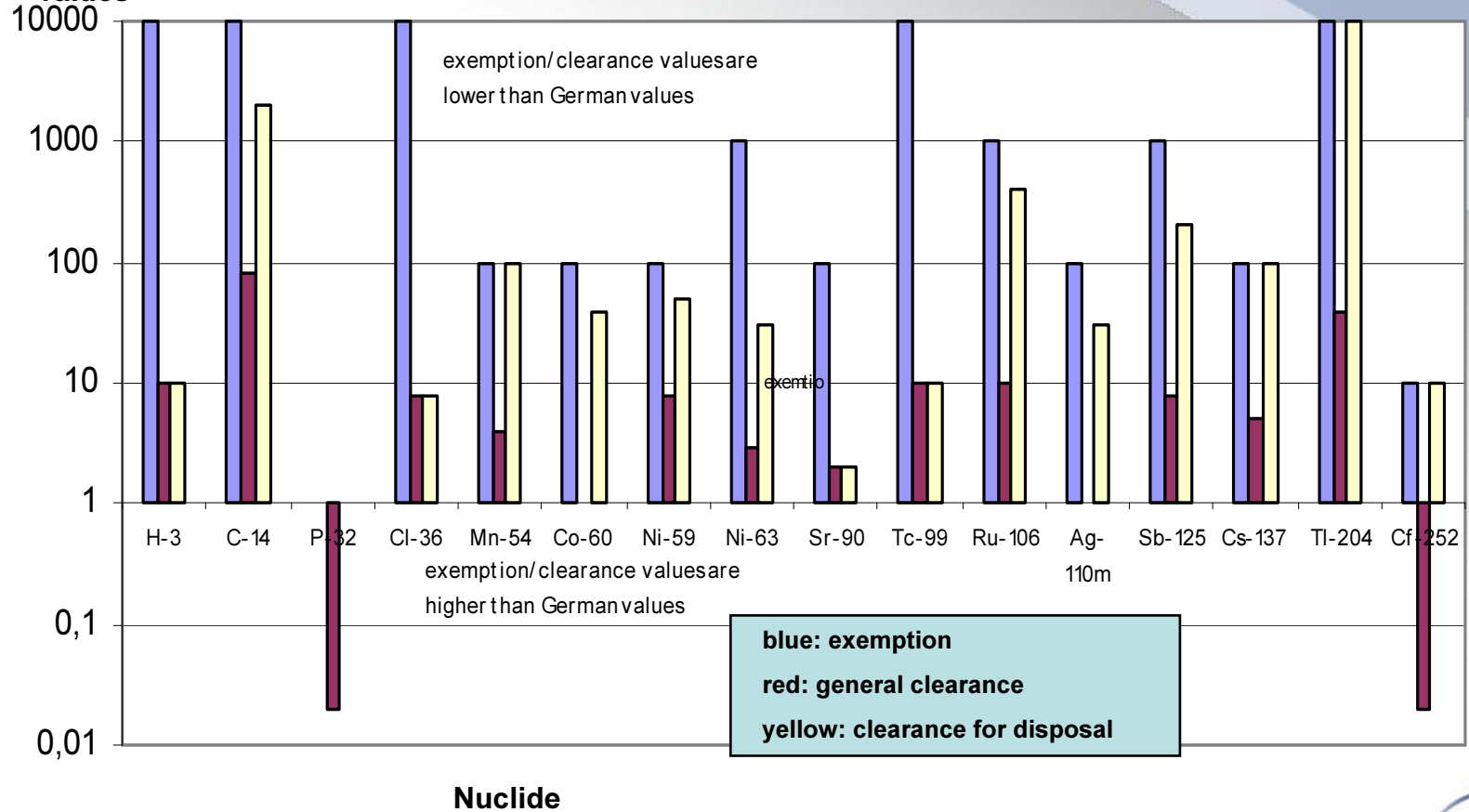
For most of the nuclides the IAEA values are corresponding with the values of the unrestricted clearance acc. to annex III of the German StrISchV.

This may lead to a prohibition of clearance pathways (for disposal etc.) with higher values.

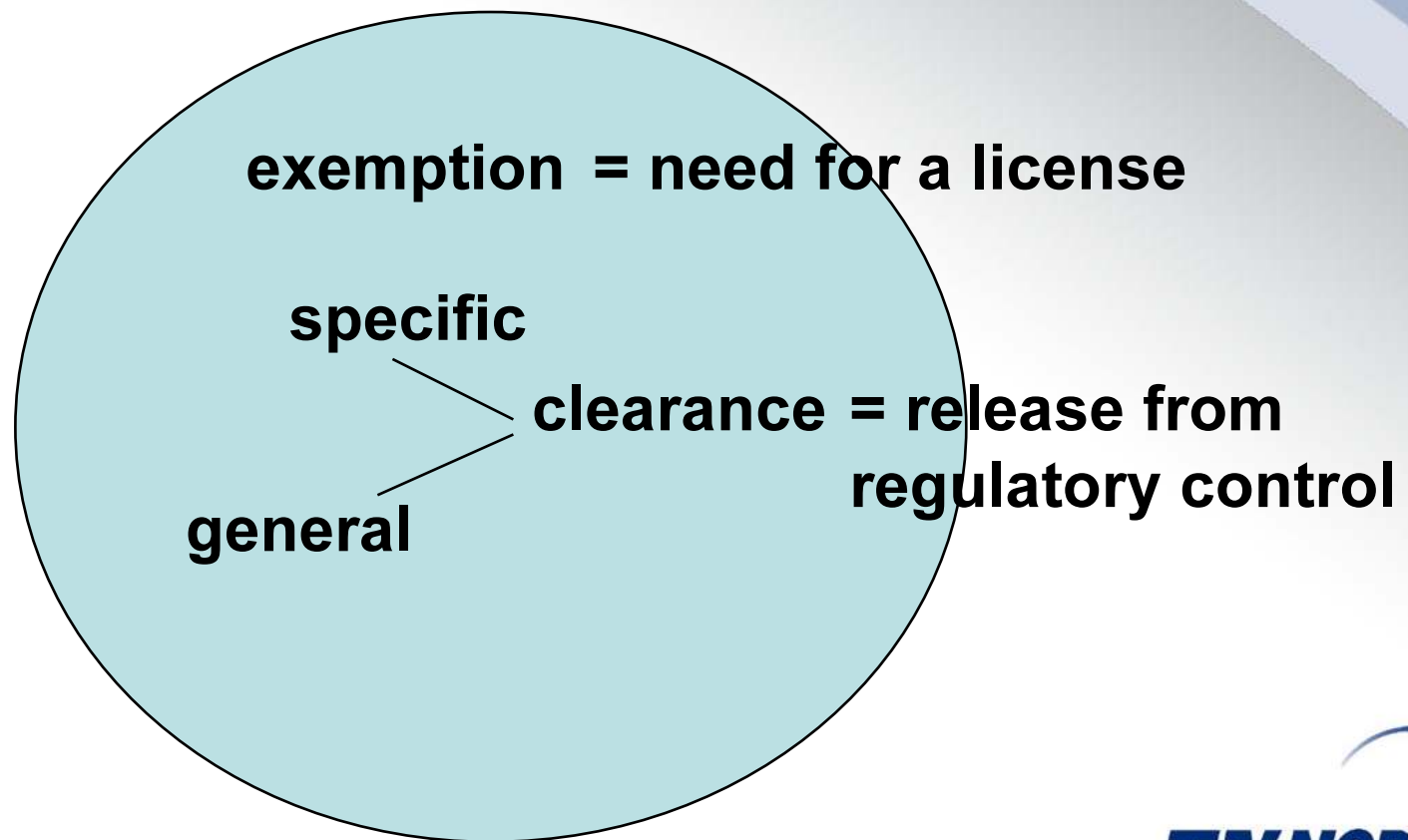
For some nuclides the IAEA values are evident higher or lower than the German values for unrestricted release.

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

ratio German/IAEA values



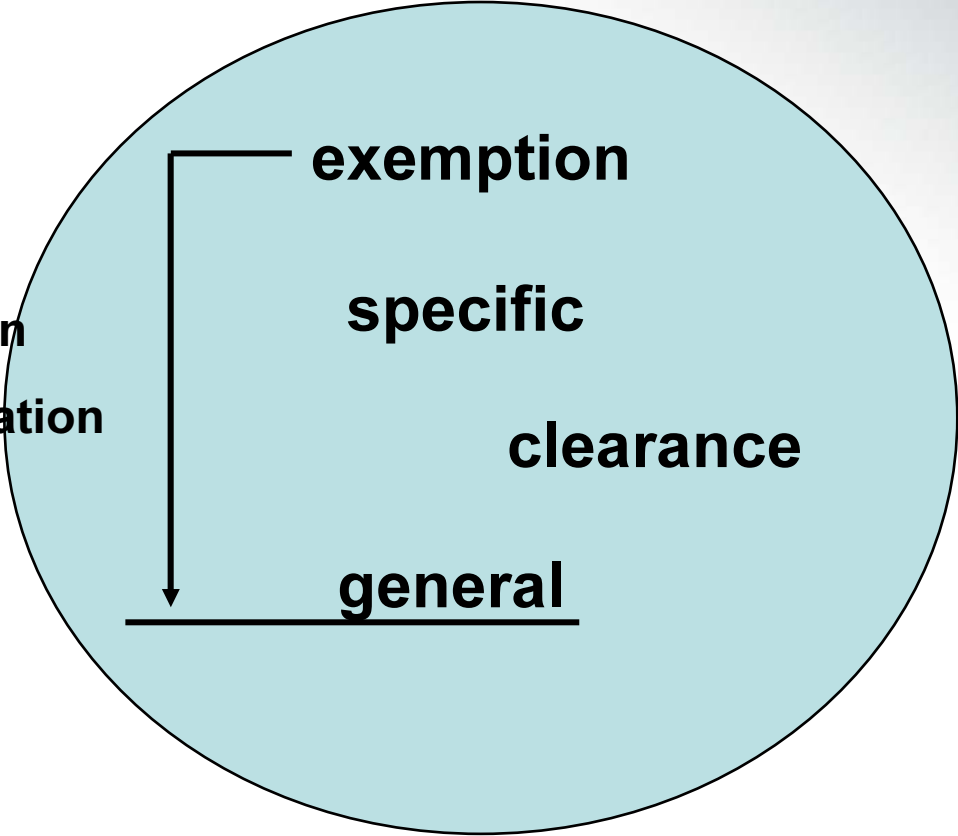
Perspective of clearance values



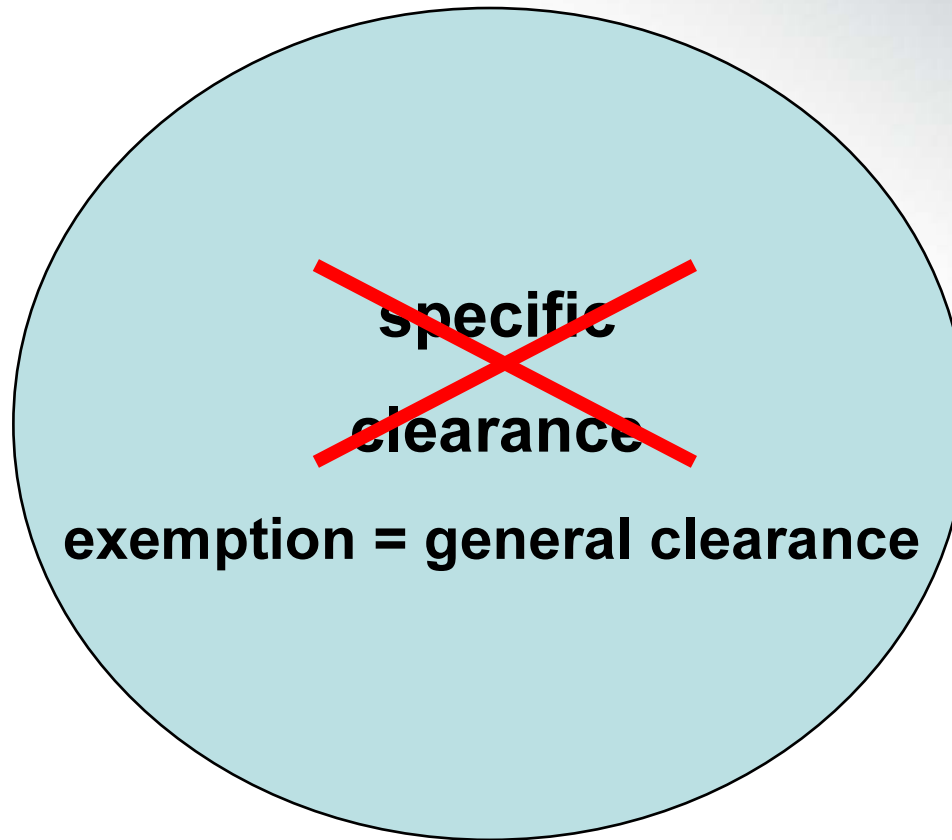
exemption values > clearance values

Perspective of clearance values

Harmonisation
and Simplification



Perspective of clearance values



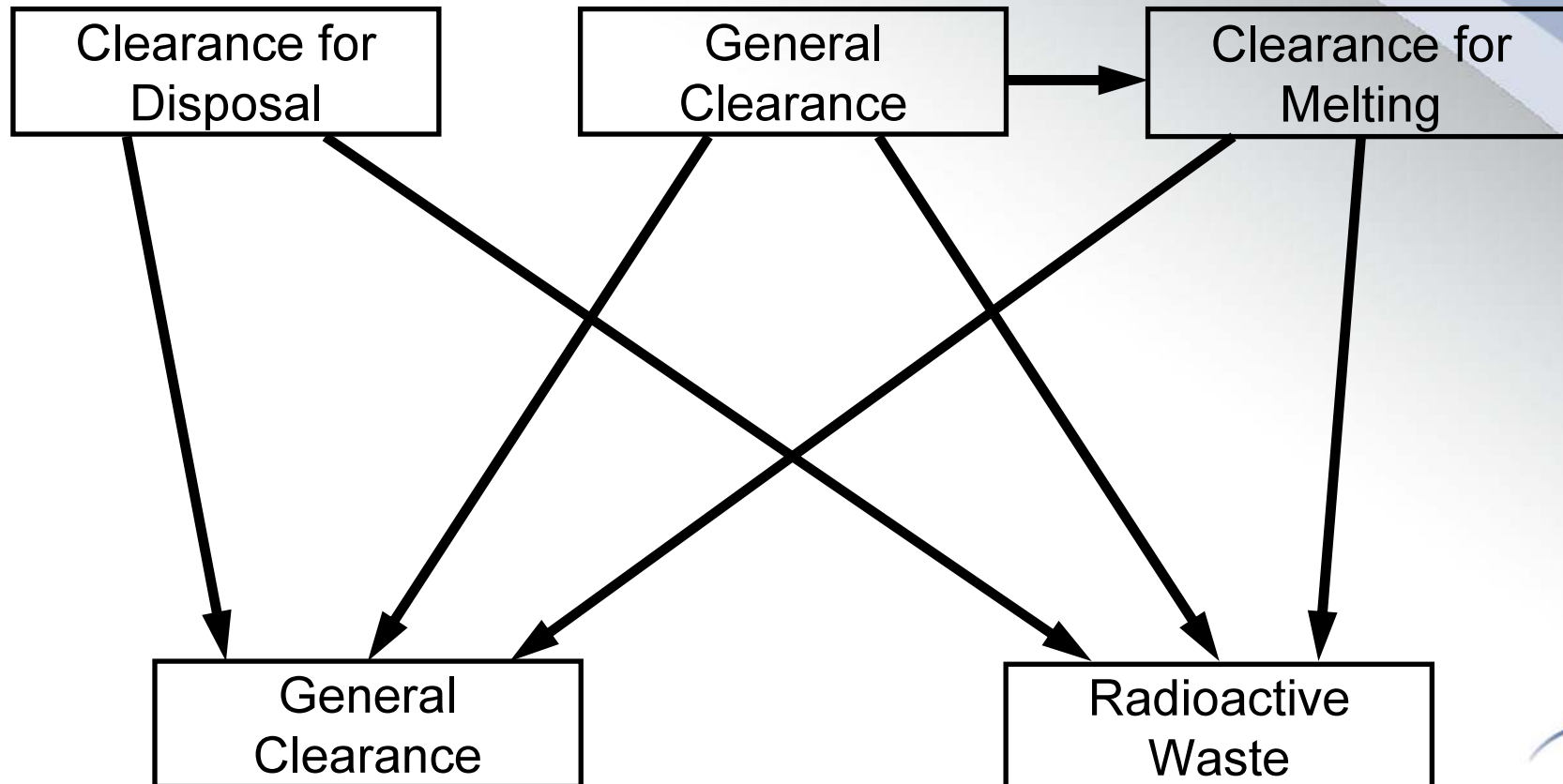
Perspective of clearance values

~~clearance for disposal of waste~~
~~clearance for melting of scrap~~
~~clearance for demolition of buildings~~
exemption = general clearance

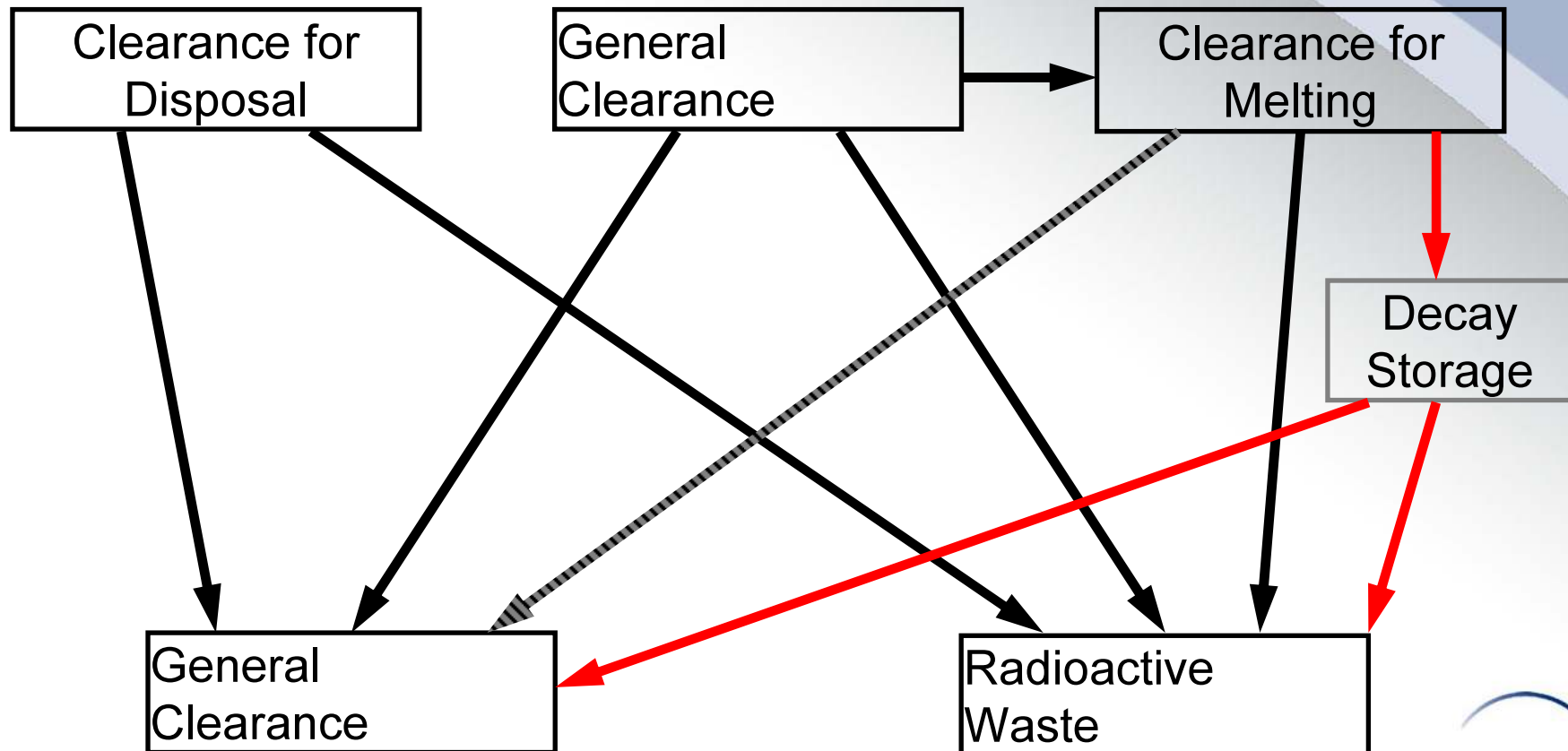
Mass balance for decommissioning projects

plant	Mass/Mg	General clearance	Recycling, reuse	Disposal, demolition	Radioactive waste
KKS actual	11.734 Mg 100%	3.763 Mg 32%	2.852 Mg 24,3%	2.830 Mg 24,1%	2.289 Mg 19,6%
total mass	101.353 Mg				
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	565.000 Mg				
actual	172.647 Mg	27.770 Mg 16%	13.472 Mg 8%	126.273 Mg 73%	5.131 Mg 3%

Approach – Option I

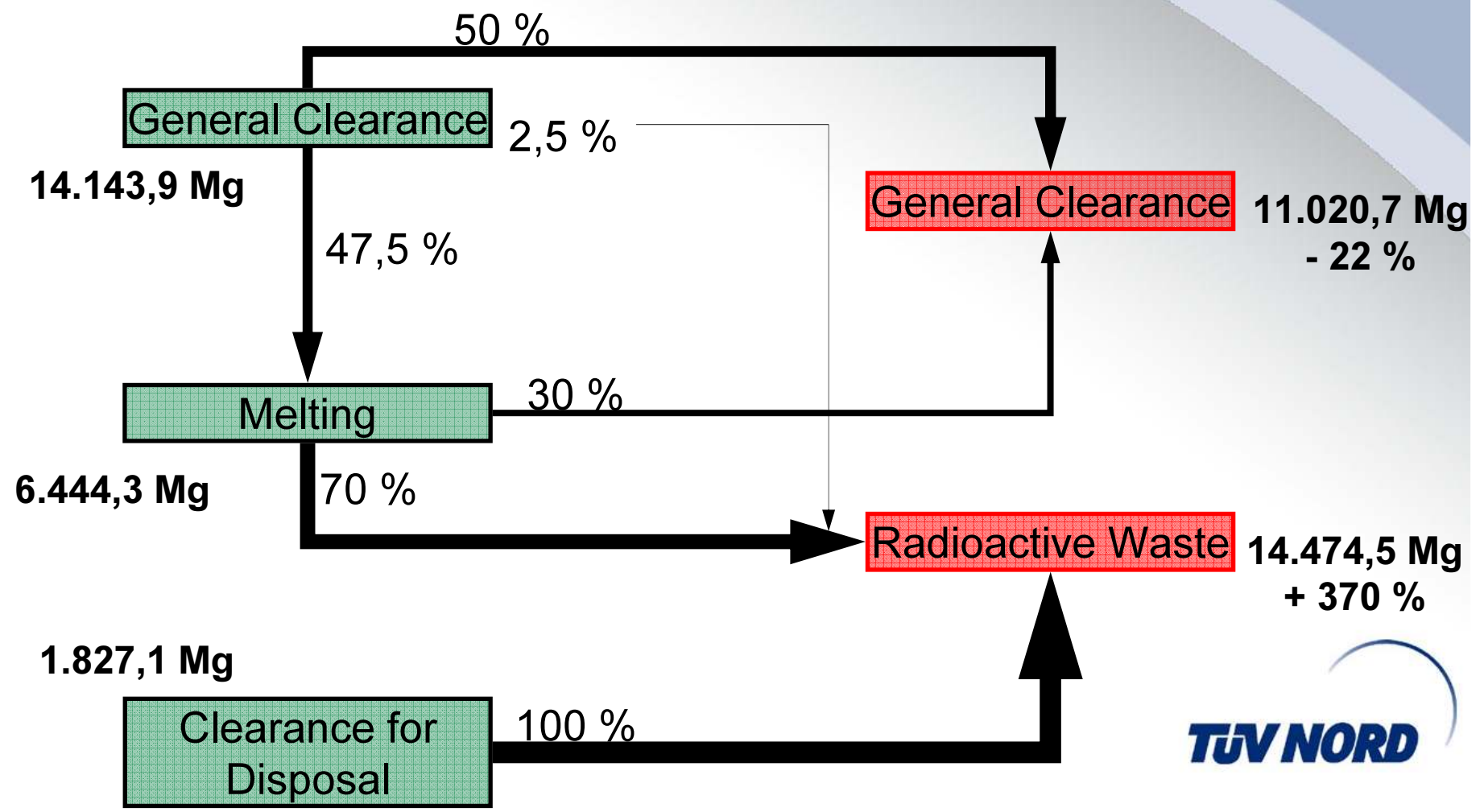


Approach – Option II with decay storage



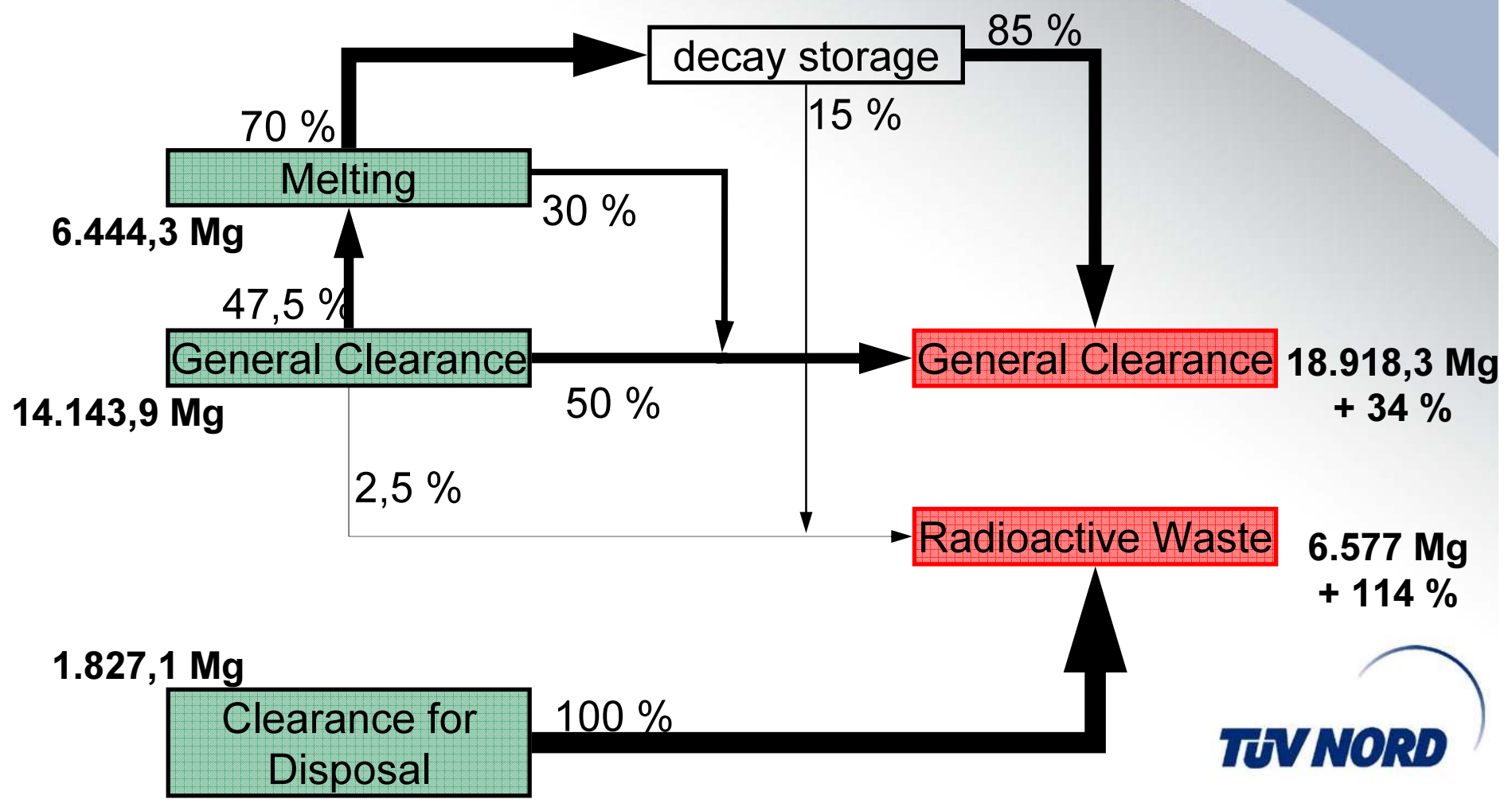
Results for NPP KWW in Germany (without decay storage)

■ RS G - 1.7
■ Actual



Results for NPP KWW in Germany (with decay storage)

■ RS G - 1.7
■ actual



Waste Volume and Costs (with decay storage)

Volume

Increase of waste for E.ON NPP (with decay storage): **approx. 38.000 Mg**

⇒ for all NPP in Germany (without research reactors): **approx. 115.000 Mg or 100.000 m³**

Costs

For conditioning approx. 6.000 €/Mg ⇒ approx. 0,7 Bill. €

repository approx. 12.000 €/m³ ⇒ approx. 1,2 Bill. €

new interim storage capacities on site (10 Mio € per site)
⇒ approx. 0,15 Bill. €

additional costs for transport and casks (approx. 10.000 container,
approx. 25.000 €/Cont.) ⇒ approx. 0,25 Bill. €

⇒ Sum **approx. 2,3 Bill. €**

⇒ Costs for research reactors and industrial plants ? **TUV NORD**

Waste Volume and Costs (without decay storage)

Volume

Increase of waste for E.ON NPP (without decay storage):

approx. 66.000 Mg

⇒ for all NPP in Germany (without research reactors):

approx. 210.000 Mg or 180.000 m³

Costs

For conditioning approx. 6.000 €/Mg => approx. 1,26 Bill. €

repository approx. 12.000 €/m³ => approx. 2,16 Bill. €

new interim storage capacities on site (10 Mio € per site)

=> approx. 0,15 Bill. €

additional costs for transport and casks (approx. 18.000 container,
approx. 25.000 €/Cont.) => approx. 0,45 Bill. €

⇒ Sum **approx. 4 Bill. €**

⇒ Costs for research reactors and industrial plants ?

Conclusions

1. Clearance

The exemption limits are the upper bound for clearance regulations. In case of reducing the exemption levels the specific clearance levels are above the exemption limits and have to be abandoned.



Conclusions

2. Waste

In case of the future decommissioning of 24 NPPs in Germany a study has shown an increase of the amount of radioactive waste of approx. **210.000 Mg**. The capacity of the licensed repository KONRAD will not be sufficient in Germany.

plus
210 000 Mg

3. Cost

The treatment, transport and storage of this additional waste would lead to approx. **4 Bill. €** (research centers are not included!)

**plus
4 Bill.€**

4. Dose

To keep the future clearance values the work of decontamination and treatment of waste will increase espec. in decommissioning projects. This will also lead to an **increase of the dose of the workers** without having a benefit, because the dose for the public is in both cases trivial.