



ONDRAF/NIRAS

PREDIS WP6 seminar
solid organic waste:
a wmo perspective

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Outline

solid organic waste: a wmo perspective

- Where does it come from?
- What is the problem?
- How do we tackle it?

SOLID ORGANIC WASTE

WHERE DOES IT COME FROM?

Belgium has a large variety of waste streams. Some of them contain solid organic waste in different forms:

Cellulose-containing waste

Bituminised waste

waste conditioned in a polystyrene matrix

Resins from NPP

...

SOLID ORGANIC WASTE

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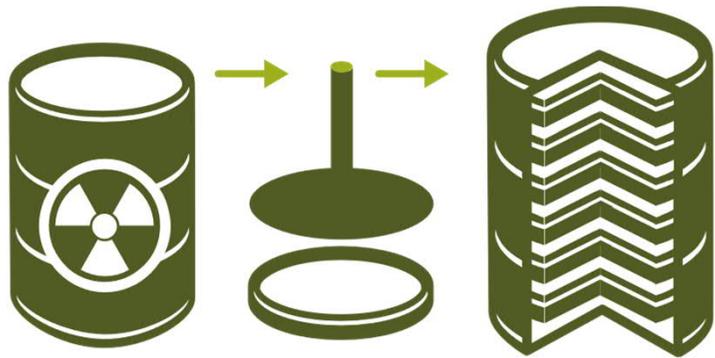
waste conditioned in a polystyrene matrix

Resins from NPP

...

Cellulose-containing waste

WHERE DOES IT COME FROM?



Important sources of cellulose are for example **tissues** and **filters** from NPP

Most of the cellulose-containing waste is **cemented**

Waste that is radiological compatible with both **surface** and geological **disposal**

Cellulose-containing waste

What is the problem?

Surface disposal: long term safety strategy



The disposal system is the set of elements that contribute to the **isolation** and the **containment** of the radionuclides

long-term safety assessment are to demonstrate, taking into account all safety relevant uncertainties that the estimated **radiological impacts** are **consistent** at all times with the **assessment criteria** and the performance of the repository provides a sufficient level of **layered protection**

Cellulose-containing waste

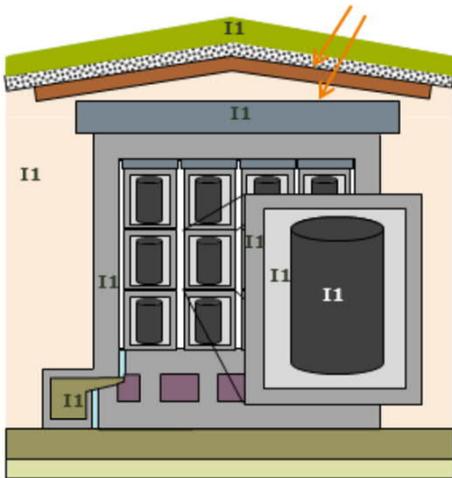
What is the problem?



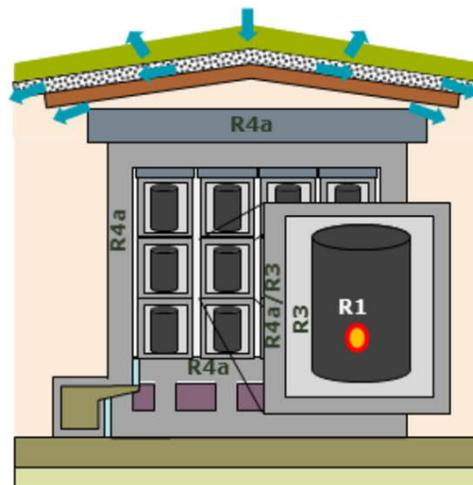
Up to 350 a

Access control I1
Fencing of the site I1

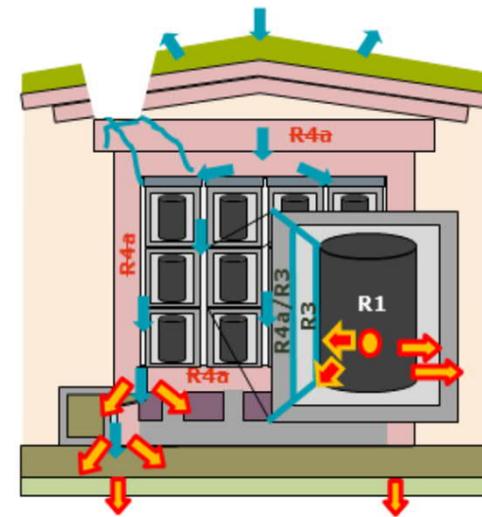
Low sensitivity to erosion



Up to 1,000 a

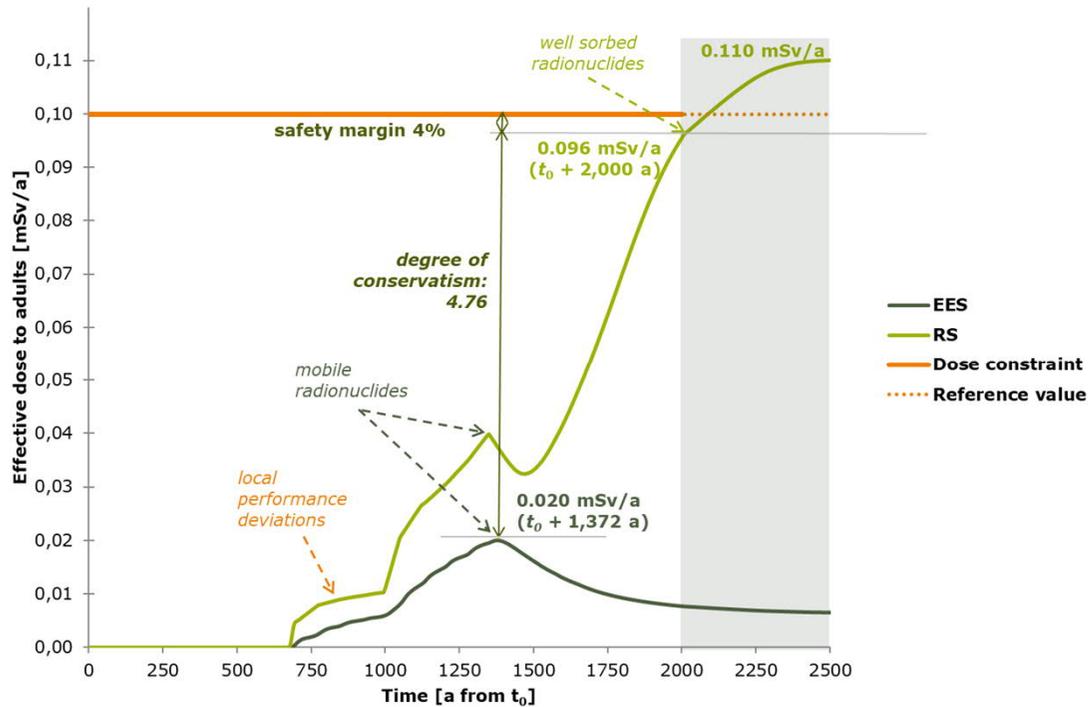
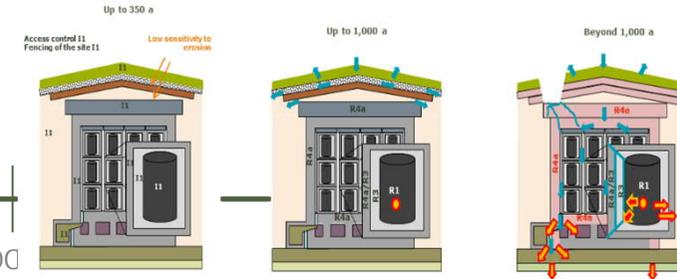
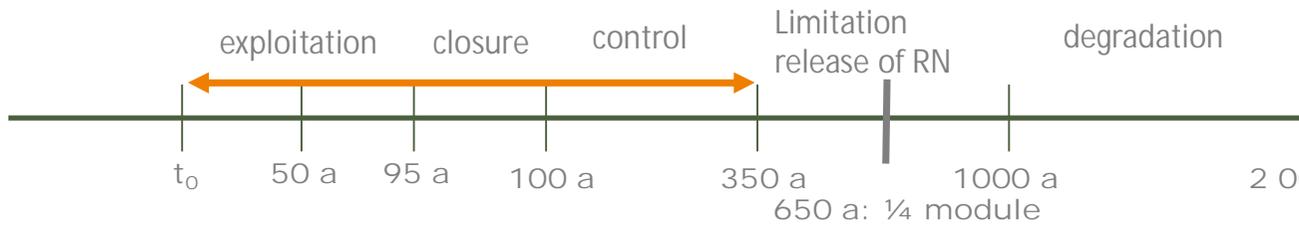


Beyond 1,000 a



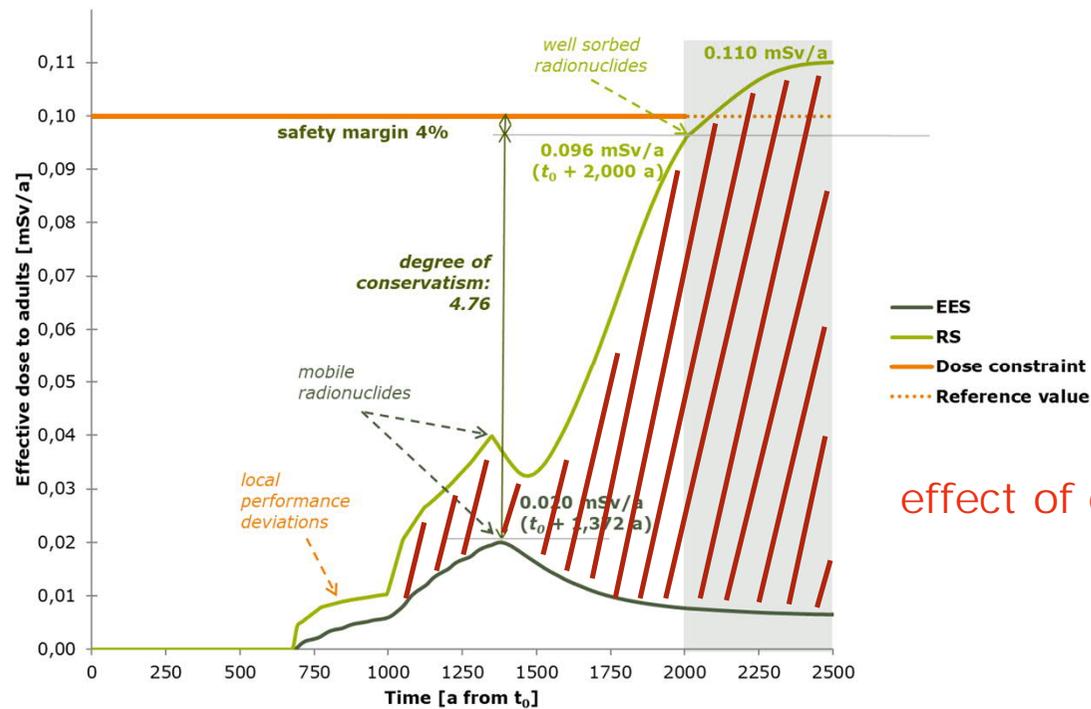
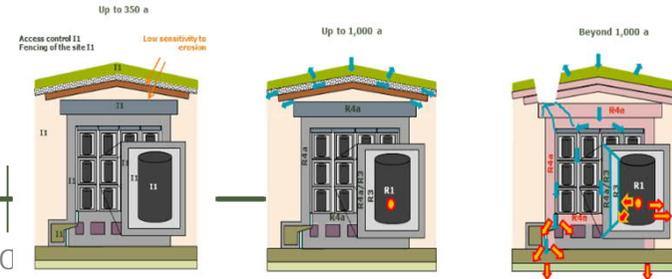
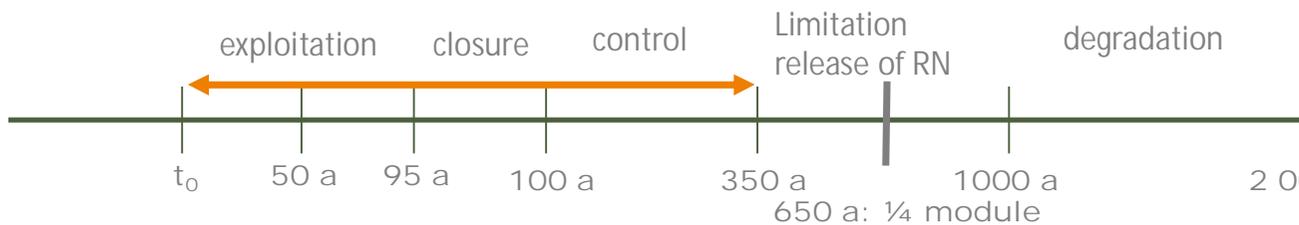
Cellulose-containing waste

What is the problem?



Cellulose-containing waste

What is the problem?

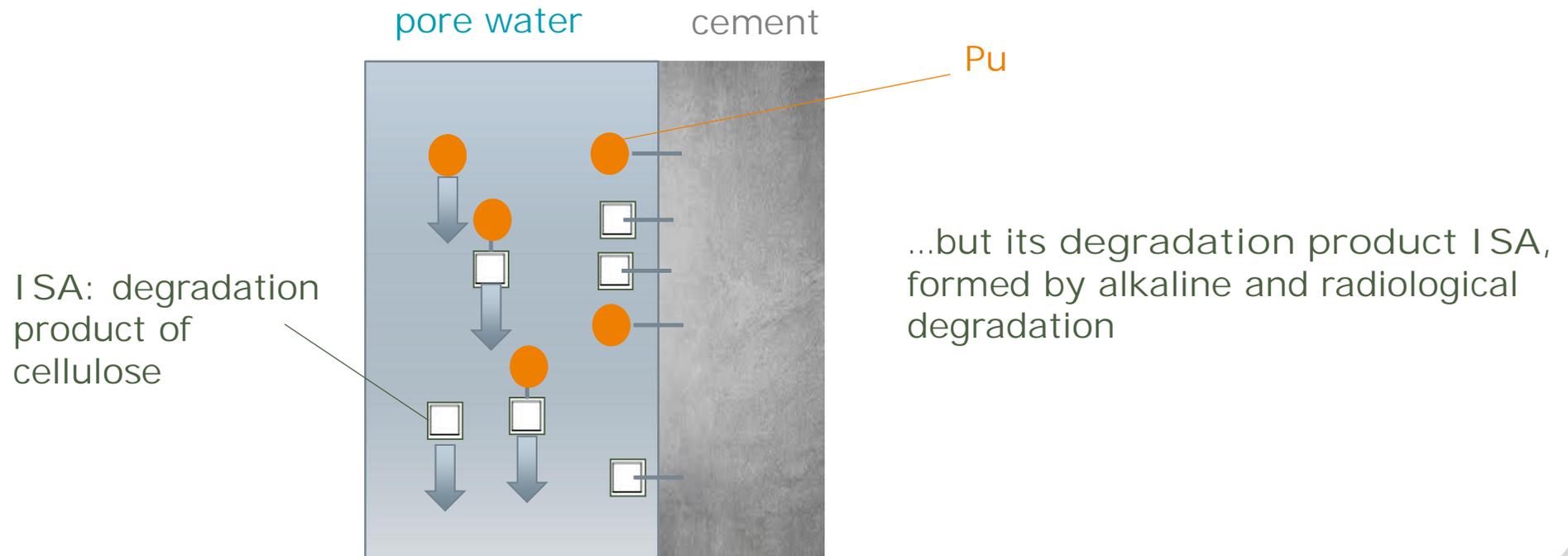


effect of cellulose and CI

Cellulose-containing waste

What is the problem?

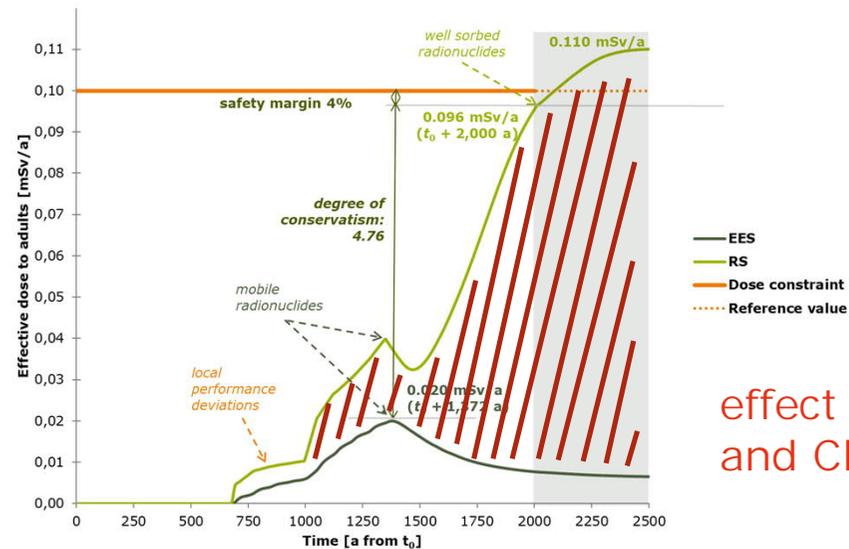
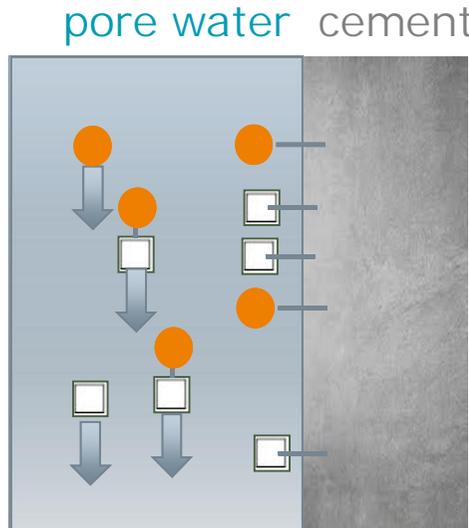
The problem is not the cellulose in itself...



Cellulose-containing waste

What is the problem?

The problem is not the cellulose itself, but its degradation product ISA



effect of cellulose and CI

Complexing agents should not increase the radiological impact on the long term → conformity criteria

Cellulose-containing waste

How do we tackle this?

Conformity criteria depend on the waste. 'General' criteria:

100 g/400 L drum and 400 g/MON



Need for a very good knowledge of the waste. Not always the case, especially not for historical waste.



Better characterization of the waste:

by the producers

by NIRAS: theoretical and validated by DT/NDT techniques

Cellulose-containing waste

How do we tackle this?

Conformity criteria dependent on the waste. 'general' criteria

100 g/400 L drum and 400 g/MON



Limit is in any case very low: even with a good knowledge difficult to be compliant with this criteria. Can this limit be increased?

Limit is based on very conservative assumptions:

complete and immediate conversion of cellulose in ISA

threshold value of ISA under which no effect on the sorption is measured: 10 x lower than scientifically assumed

→ Higher limit seems possible, BUT need for very strong justification

Cellulose-containing waste

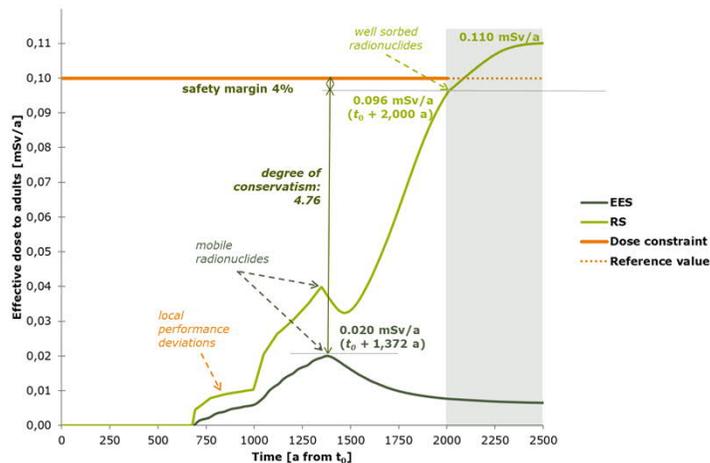
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1. Theoretical evaluation of all involved parameters
2. Waste-specific approach: filters embedded in epoxyresins: positive effect on the sorption?
3. Sorption tests of LL-RN on cement (1) and by taking into account ISA (2) (focus on Pu and Nb)

Cellulose-containing waste

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Limit is in any case very low: even with a good knowledge difficult to be compliant with this criteria. Can this limit be increased?



For waste that is still not compliant with (adapted) acceptance criteria: **reconditioning** might be an option (see later)

Bituminised waste

Where does it come from?

GEOLOGICAL DISPOSAL

EUROBITUM (1978-1999)

Mostly homogeneous ILW, resulting from the reprocessing of spent fuel at the Eurochemic plant (1966 – 1975)

Hard bitumen Mexphalt 20/40

α -room (1981-1988) and $\beta\gamma$ -cell (1986)

Heterogeneous LLW, produced at the waste department of SCK CEN, from various sources

Soft bitumen

MUMMIE (1982-2004)

Mainly sludges from LLW water treatment

Soft bitumen

SURFACE DISPOSAL

Bituminised waste

What is the problem?

Some non-conformities are observed during storage:

- **overflow** of the **bitumen**: understanding the process is necessary for the disposal of the waste (generic vs specific)
- **corrosion** of the welding: optimizing the storage conditions
- **flammability** of the waste: both for storage, post-conditioning and disposal

Bituminised waste

What is the problem?

Some issues related to disposal:

- (geo -)mechanical perturbation: due to water-uptake of the salts and semi-permeable bitumen
- Geochemical perturbation (only for geological disposal): leaching of nitrate salts

Bituminised waste

How do we tackle this?

20 years of R&D: EUROBITUM compatible with geological disposal

What about MUMMIE for surface disposal?

➔ No WAC for this waste upto now.

➔ Evaluation of disposability is difficult, BUT

- Need for better characterisation
- Transfer of knowledge from EUROBITUM
- New water-uptake tests?
- 'Plan B': reconditioning

SOLID ORGANIC WASTE

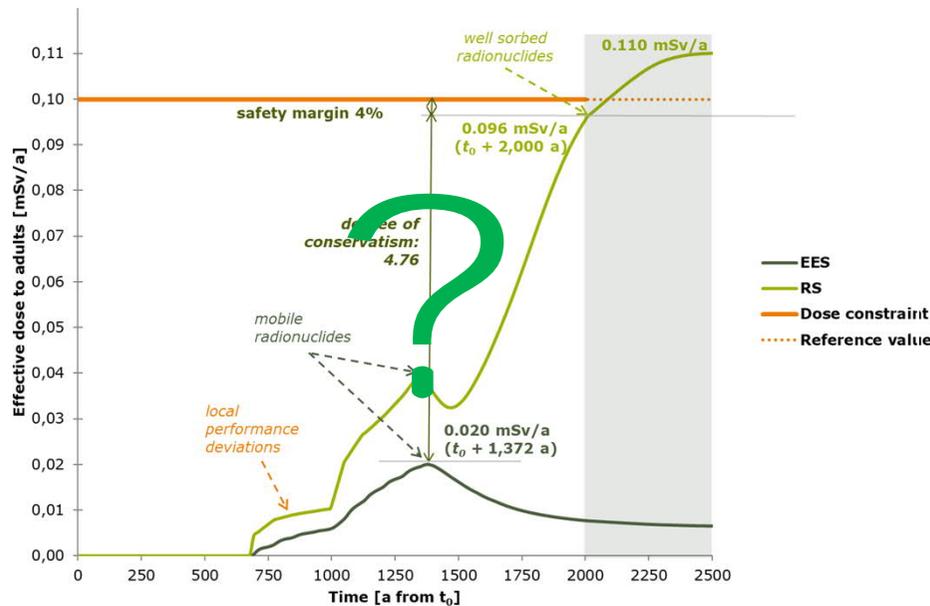
How do we tackle this?

By reprocessing of the waste?

Focus is on a reprocessing technique that can handle different waste types like plasma (see presentation J. Hansen)

Safety perspective:

- Waste should not affect the EBS of the disposal system
- Conditioning matrix has a safety function:
 - = sorption on cement should be replaced by the 'new matrix'
- WAC need to be developed for each new waste type
 - = complete evaluation today is difficult



SOLID ORGANIC WASTE

conclusions

- Different types of organic waste forms each with their own issues
- Approach depends on the organic waste form and the waste stream itself
- Different approaches are investigated in parallel
- Surface disposal: priority is on disposal as such, reconditioning is a 'plan B'