BUILDING A DIGITAL VISUAL TOOL FOR CIVIL SOCIETY

10.04.2024 • Colin Wales

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BACKGROUND HISTORY

In essence the idea stemmed from an EURAD workshop which focused on intergenerational.
A rough drawing was produced ((1) attached)). The drawing could serve as a front-end Web interface from which users could access further information.
At that point, Professor Simon Norris who is the principal research manager for NWS wrote back attaching his own 1-page A4 what matters informatic. ((2) attached)

The drawing 1 was presented during a workshop to which Marina from FANC thought it should be cleaned up.

A graphic artist produced a digital drawing ((3) attached). Another drawing using the same graphic artist incorporates one of the elements Simon describes in his informatic ((4) attached).

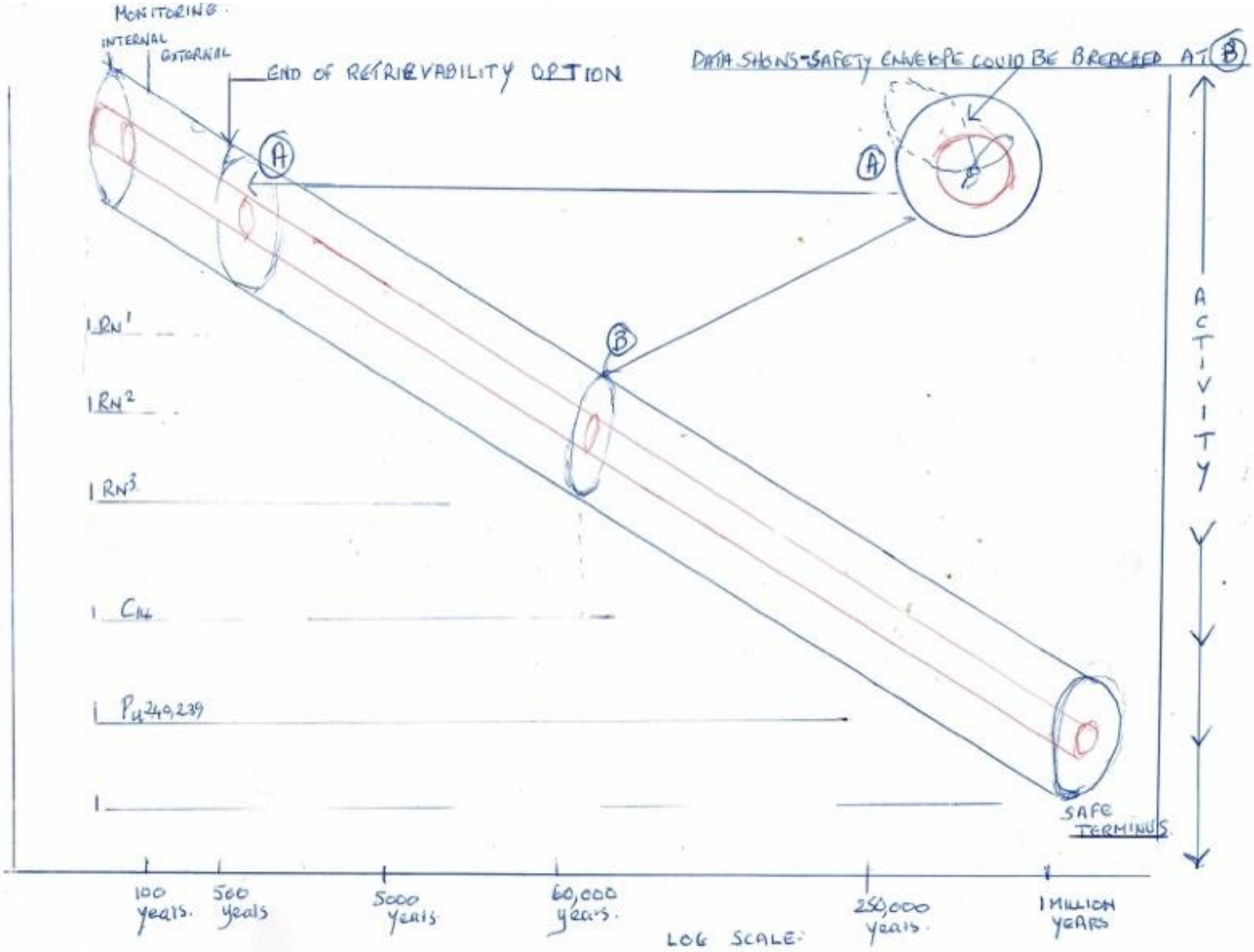
This final graphic should give the viewer a clear understanding as to the value of an interactive pedagogical tool which could enable CS to better understand the process of repository evolution.

It also occurs that by inputting different waste inventories the tool could be useful to other nation states.

Other actors from EURAD or within SITEX could be interested.

Finally, the interface could be potentially used to access information on uncertainties and as a redesign for the PEP board when dealing with uncertainties.

eurad


MONITORING.
INTERNAL
EXTERNAL
END OF RETRIEVABILITY OPTION
DATA SHOWS-SAFETY ENVELOPE COULD BE BREACHED AT B
A
A
B
IRN1
IRN2
IRN3
C14
Pu240,239
SAFE TERMINUS
ACTIVITY
100 years.
500 years
5000 years
60,000 years.
250,000 years.
1 MILLION YEARS
LOG SCALE.

Waste group	Volume [m³]	Fraction of total [%]
Legacy SILW / SLLW	92,600	12%
Legacy UILW / ULLW	372,000	48%
RSCs	2,610	0.3%
DNLEU	184,000	24%
NB SILW	18,900	2%
NB UILW	22,100	3%
HLW	9,880	1%
Legacy SF	17,000	2%
NB SF	39,400	5%
MOX SF	11,900	2%
HEU	2,470	0.3%
Pu	620	0.1%
Total	773,000	n/a

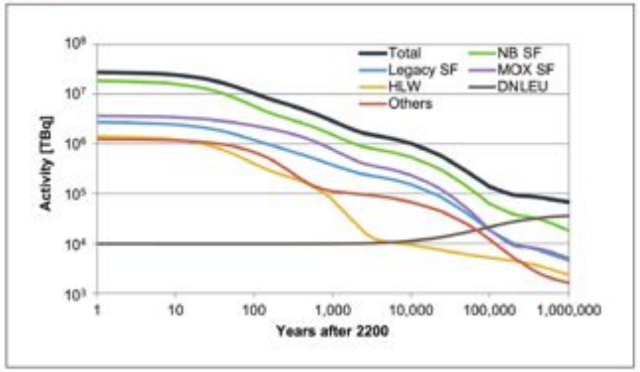
(a)

Waste group	Activity [TBq]	Fraction of total [%]
Legacy SILW / SLLW	19,400	<0.1%
Legacy UILW / ULLW	398,000	1%
RSCs	3,180	<0.1%
DNLEU	9,800	<0.1%
NB SILW	154	<0.1%
NB UILW	793,000	3%
HLW	1,460,000	5%
Legacy SF	2,780,000	10%
NB SF	19,000,000	67%
MOX SF	3,700,000	13%
HEU	53.7	<0.1%
Pu	43,700	0.2%
Total	28,200,000	n/a

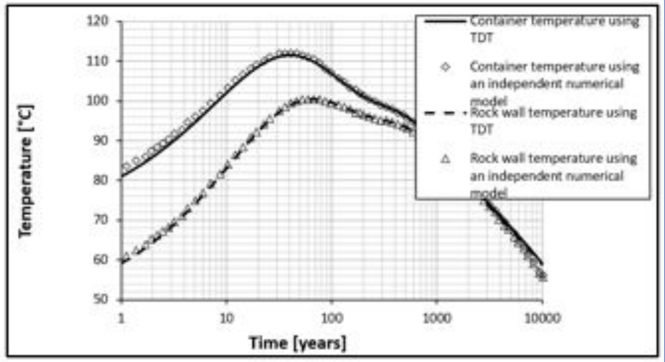
(b)

- (a), (b) Inventory composed of a range of waste categories, collectively Low Heat and High Heat Generating Wastes. High activity wastes tend to be very small by volume; lower activity wastes tend to be volumetrically large.
- (c) Environmental safety case considers safety over long times in the future, following GDF closure –waste activity significantly reduces by natural radioactive decay over this period
- (d) For HHGW, 'thermal period' considers first few thousand years of GDF post-closure period, and effects on EBS and rock
- Key radionuclides include:
  - C-14 (gas issue, operational and post-closure period)
  - Cl-36 and I-129, Se-79, Tc-99 (mobility and half-life, post-closure period)
  - U-series and Np-series decay chains (long-lived, post-closure period)
  - Co-60 (short-lived, example relating to heat output, operational and transport periods)

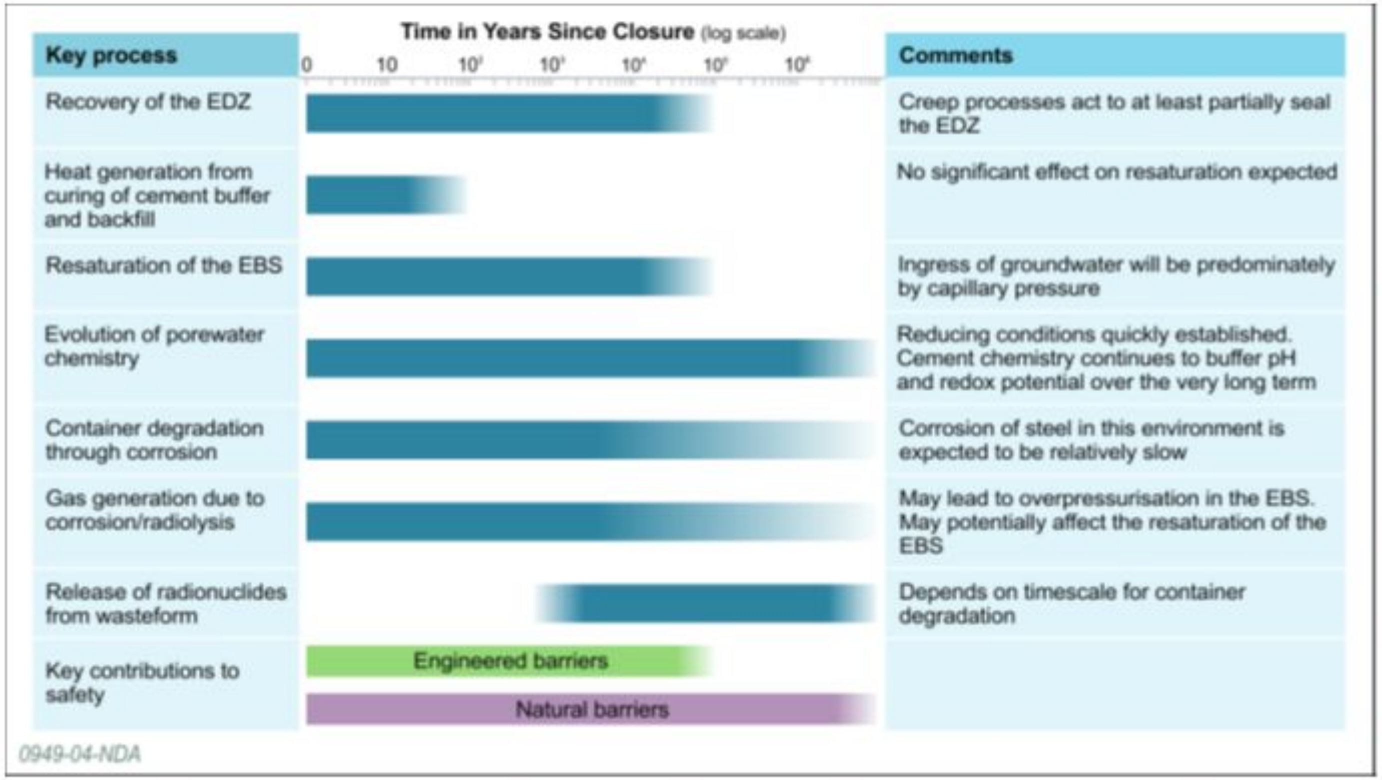
(c)



(d)



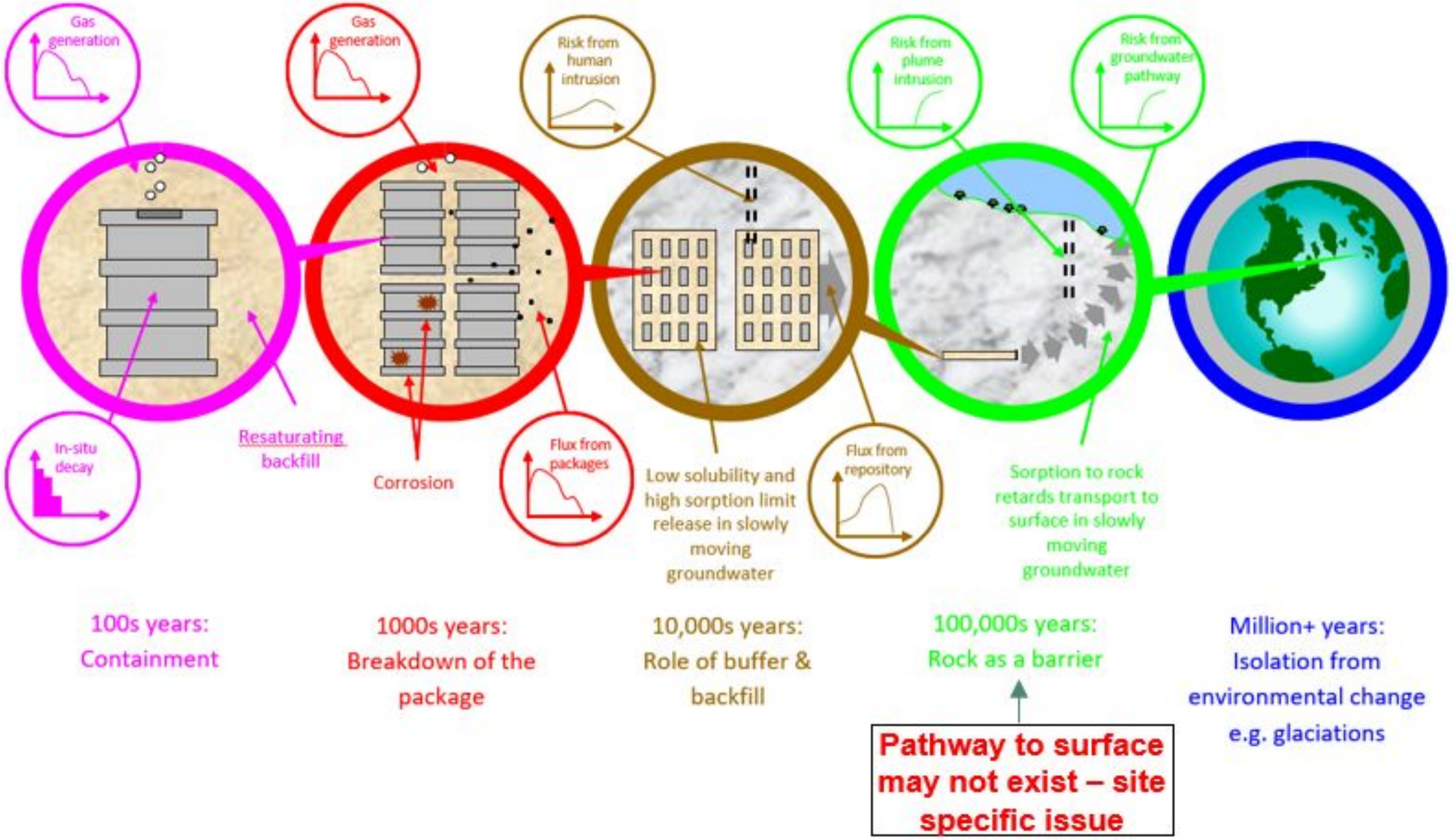
Evolution of GDF – what matters?



Also consider natural evolution of site, including seismicity, long-term natural climate change and implications of e.g. permafrost, glaciation, ice-sheet evolution on GDF performance

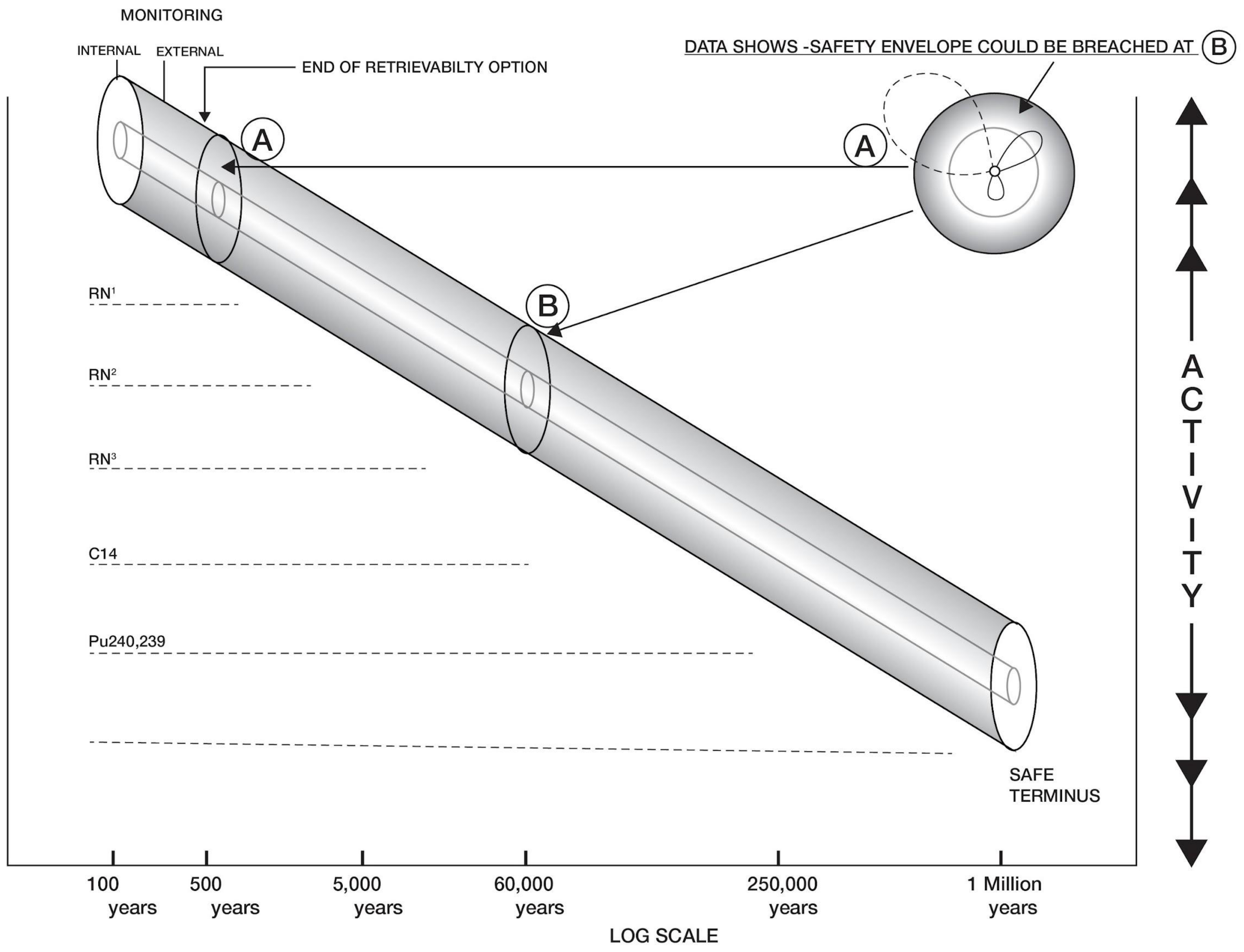
- **Thermal (T)** – waste & rock temperature evolution. ‘Thermal load’ affects H, M, G, C.
- **Hydrogeological (H)** – desaturation and resaturation of host rock, saturation of EBS and waste (affected by T, M, affects C, G). Is groundwater movement likely?
- **Mechanical (M)** – evolution of vaults, tunnels, waste packages etc. as GDF-related stress field evolves over time (voidage?). Affected by T, C; affects H. Could fracturing occur?
- **Chemical (C)** – evolution of waste chemistry, EBS chemistry, host rock chemistry. Affected by H, T, affects H, M, G.
- **Gas (G)** – gas evolution. Affected by H, T, C, affects H, M.
- **Biological (B)** – influence of microbiology. Affects G, H, affected by T, H, C.
- **THMCGB Coupled Processes**

Example - evolution of disposed LHGW



- Radioactive decay, EBS evolution, and evolution of geological environment, all need to be considered.
- Choices of Engineered Barrier System (EBS) materials dependent on waste type properties, and properties of geology including host rock.
- Pathway(s) for radionuclides and non-radiological pollutants to migrate from GDF, potentially to the Earth's surface, may not exist.
- Waste treatment – if enacted – could affect volumes of waste in GDF and waste properties.

eurad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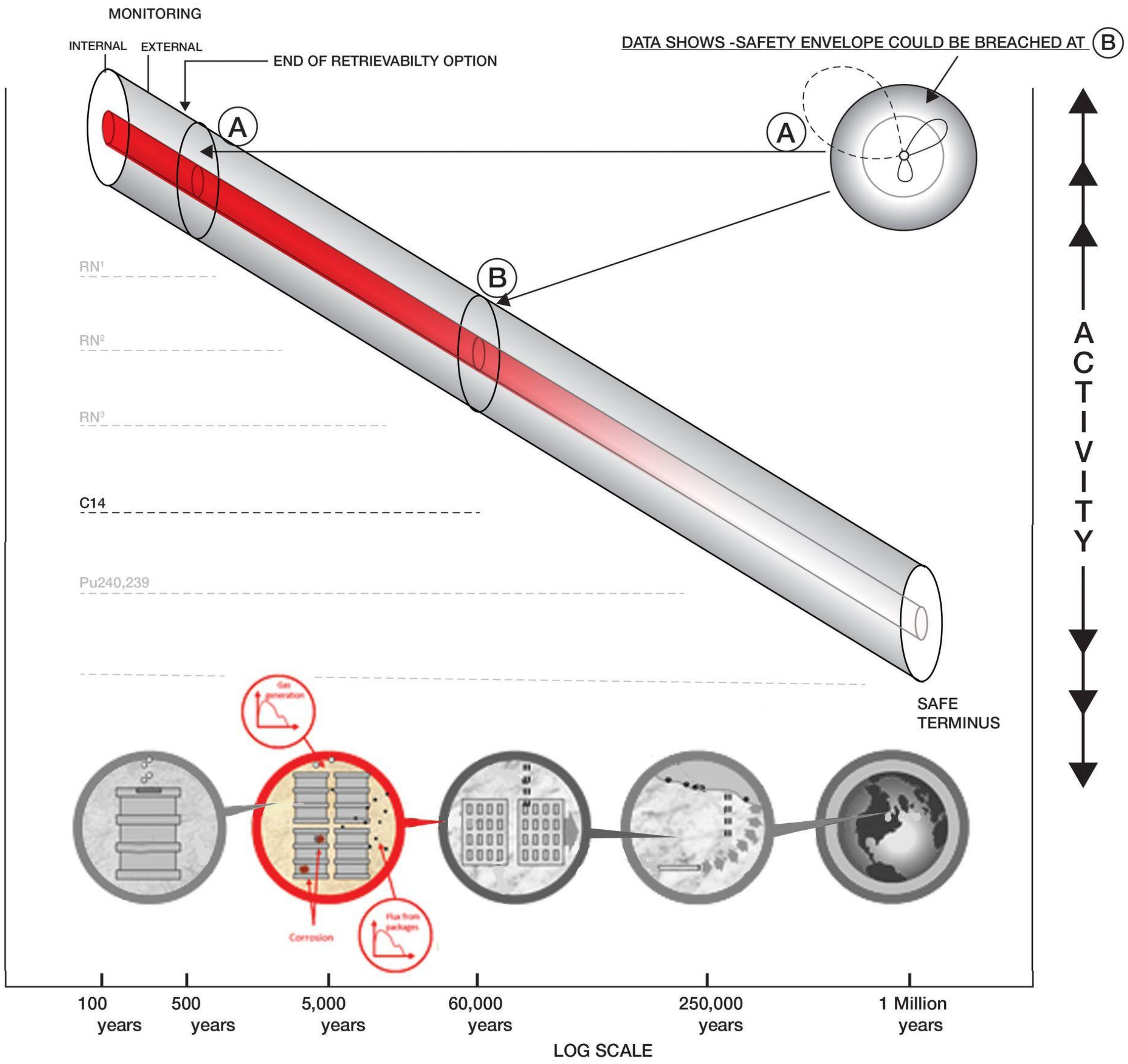
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