

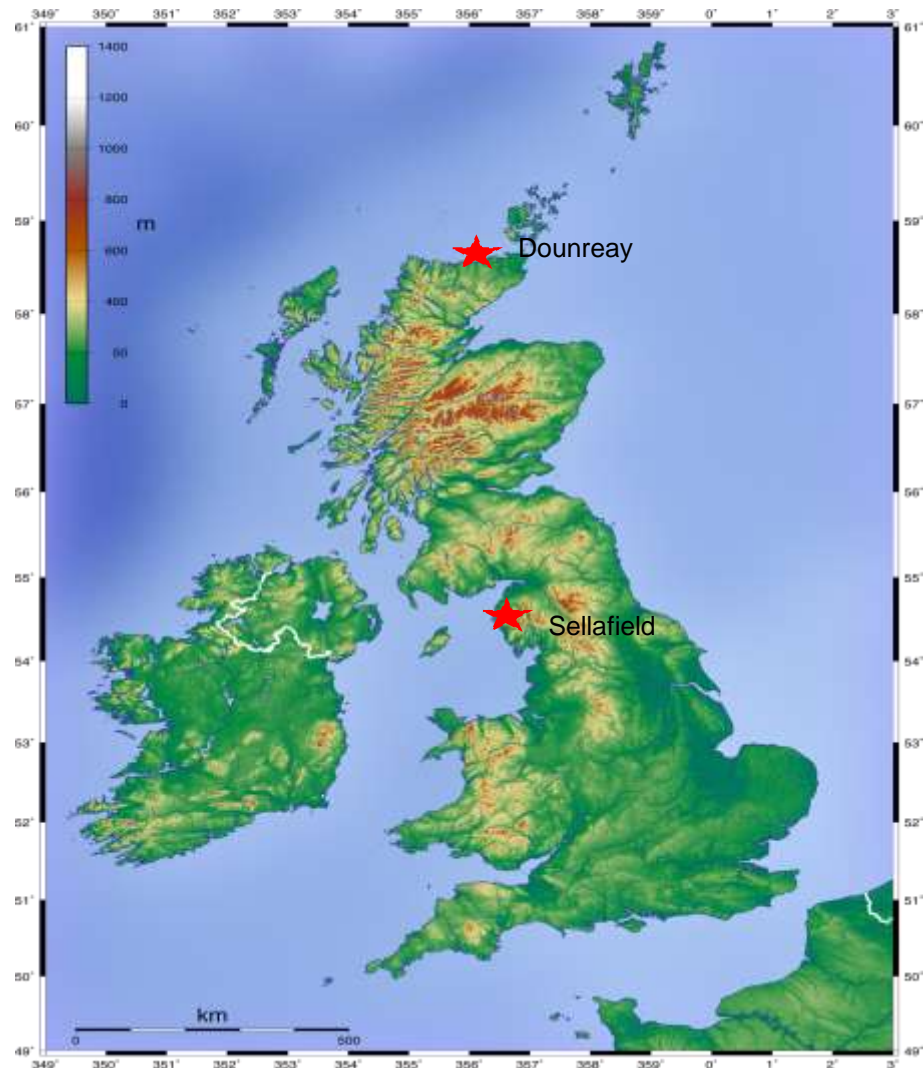
# Reprocessing Enriched Material Through The MAGNOX Reprocessing Plant At Sellafield

*Click to add text*

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# The Problem:

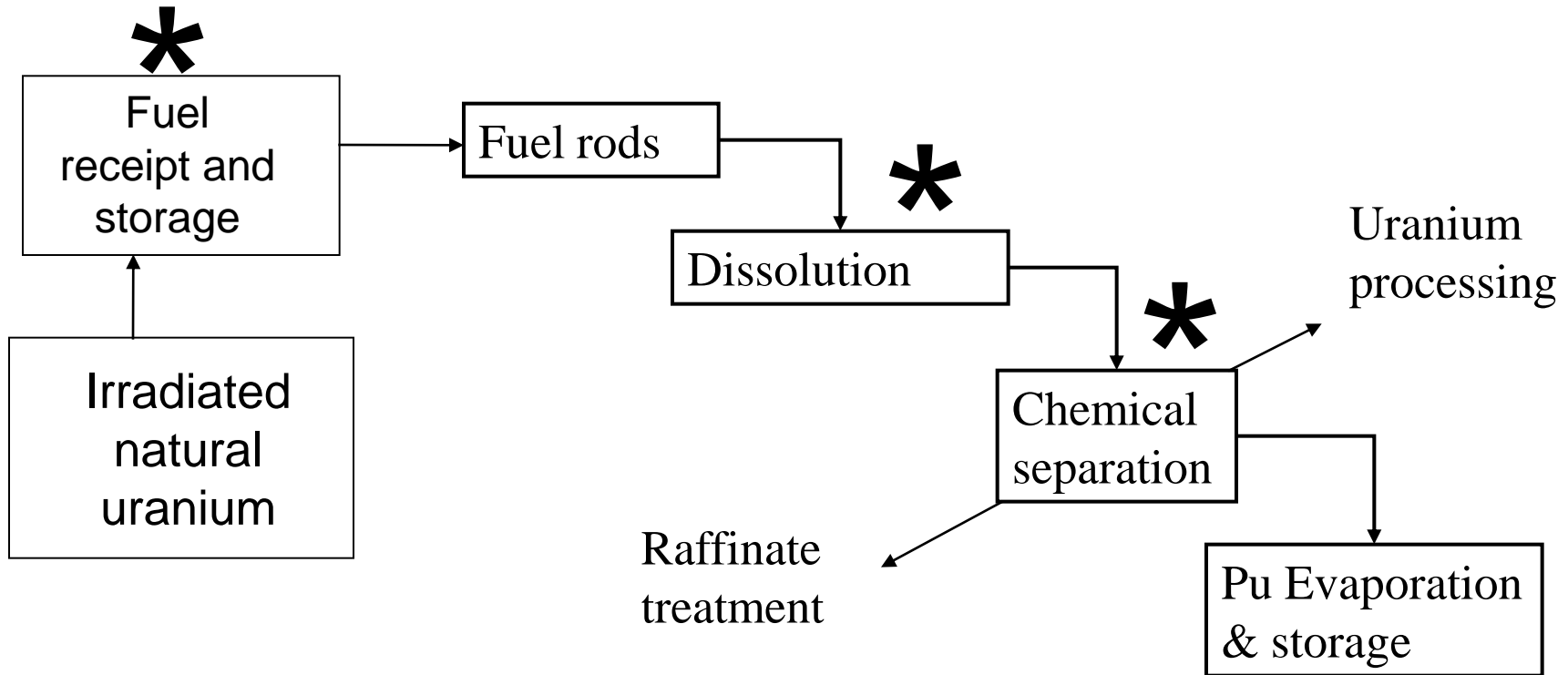
- Significant quantity of metallic material.
- Unusual isotopics.
- Requirement to make safe.
- Solution - Reprocessing?



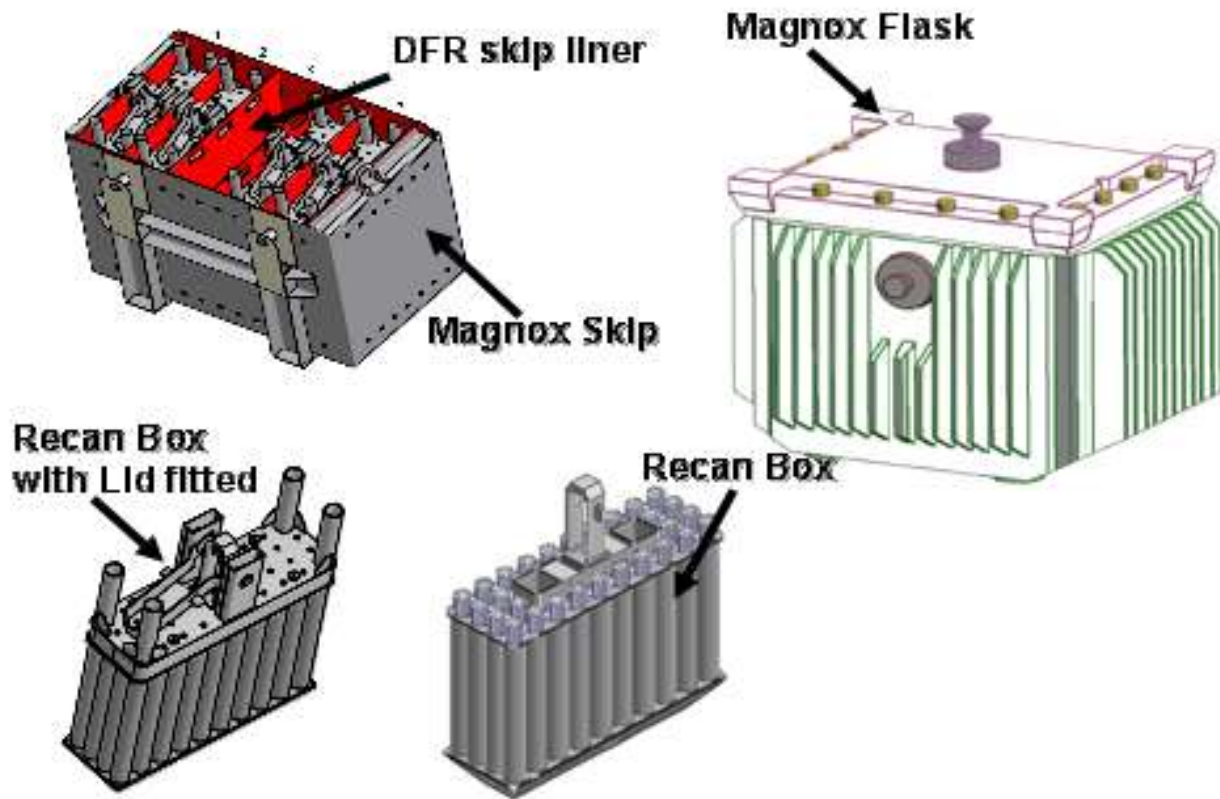
# How did we solve the problem?

- Magnox reprocessing at Sellafield
- Differences between Dounreay material and Magnox
- How the case was made:
  - Pond storage
  - Dissolution
  - Isotopics
  - Consequences

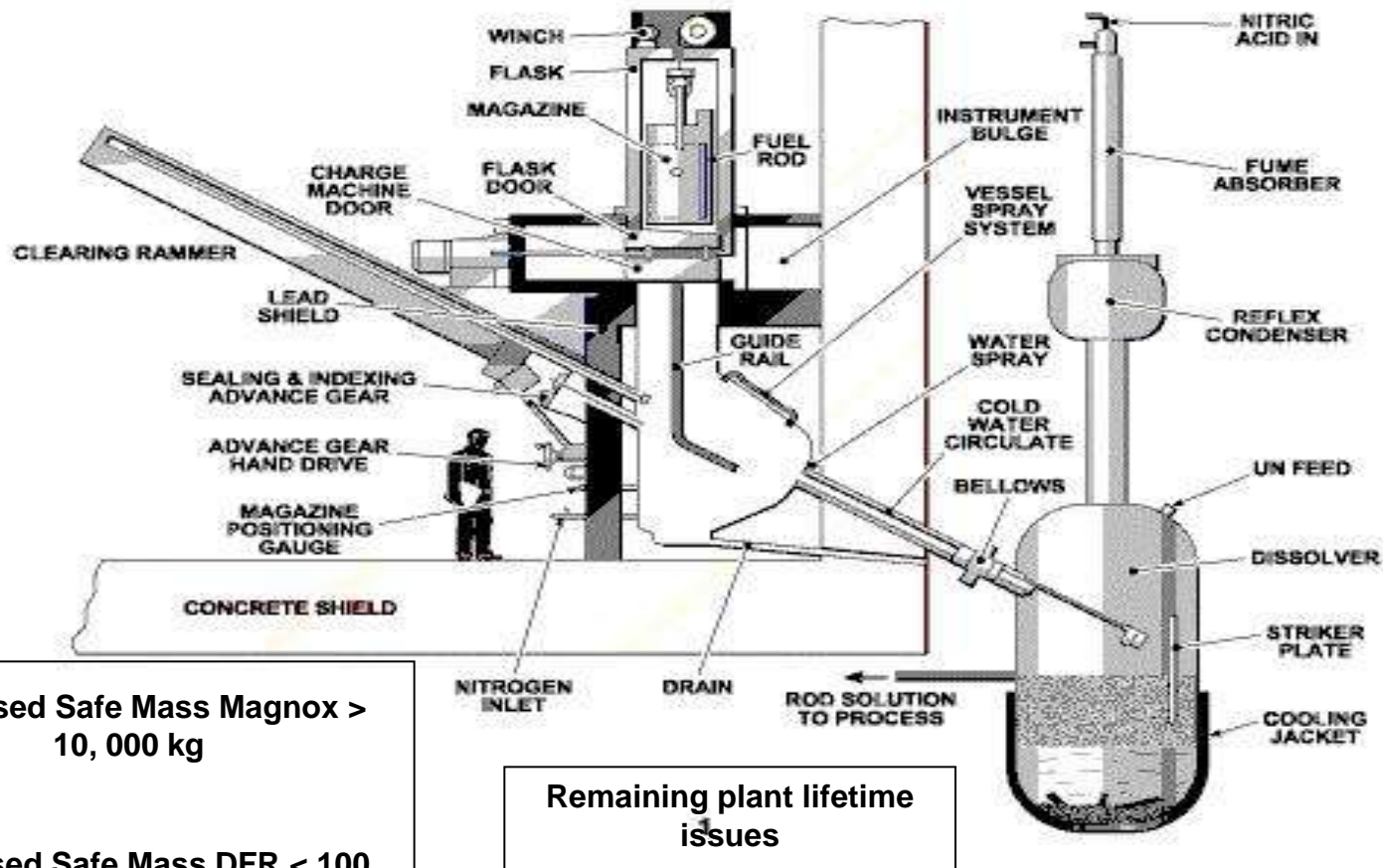
# Magnox Reprocessing at Sellafield



# Pond Storage

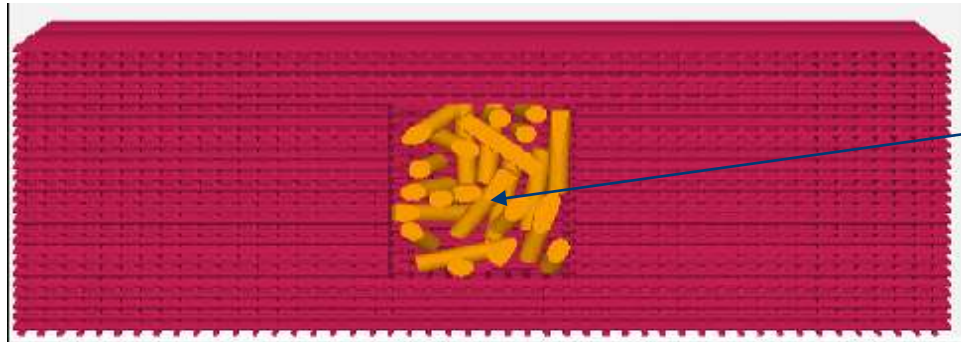


# Dissolver



# Modelling Strategy

- Optimised pessimistic background array of worst case theoretical Magnox fuel.
- RANDROD hole in the code MONK used to place a random accumulation of Dounreay slugs at the centre of the lattice.



Constrained  
within  $H=D$   
cylinder.

# Mass Controls

- Modelling demonstrated sufficiently conservative (but not deterministic) safe mass.
- Taking into account:
  - Safe mass and
  - Dissolution half life,

a safe regime of blending of Dounreay magazines with Magnox feed was established.



# Isotopics

- Neutron monitors assume certain isotopics.  
Dounreay isotopics very different to Magnox.
- Blending regime ensures overall isotopics largely unchanged.

# Consequences

- Shielding calculation performed for worst placed operator. Assuming  $2 \times 10^{19}$  fissions (MCBEND):

<b>Table 1: Shielding calculation operator dose results</b>		
<b>Source of radiation</b>	<b>Coefficient of variance (%)</b>	<b>Dose (<math>\mu\text{Sv}</math>)</b>
Fission neutrons	$\pm 5.4$	$4.634 \times 10^4$
Secondary gamma	$\pm 3.7$	$2.061 \times 10^4$
Prompt fission gamma and fission product gamma	$\pm 10.0$	9.127
<b>Total Dose*</b>		$67 \pm 2.6$ mSv

# Summary

- Case made to process Dounreay through Magnox Reprocessing plant.
- Case approved by all stakeholders – overall ALARP context important.
- Reprocessing underway.