SNETP
Sustainable Nuclear Energy Technology Platform

Sellafield Ltd

Sellafield Challenges: Steering the Supertanker

David Connolly, ***Head of Thermal Treatment***

The Journey

- The Sellafield Supertanker
- Doing the Dishes: when is it clean enough?
- An Autopsy of Value
- Melting the Cost of Waste

BEING A SUPERTANKER ISN'T ALL BAD

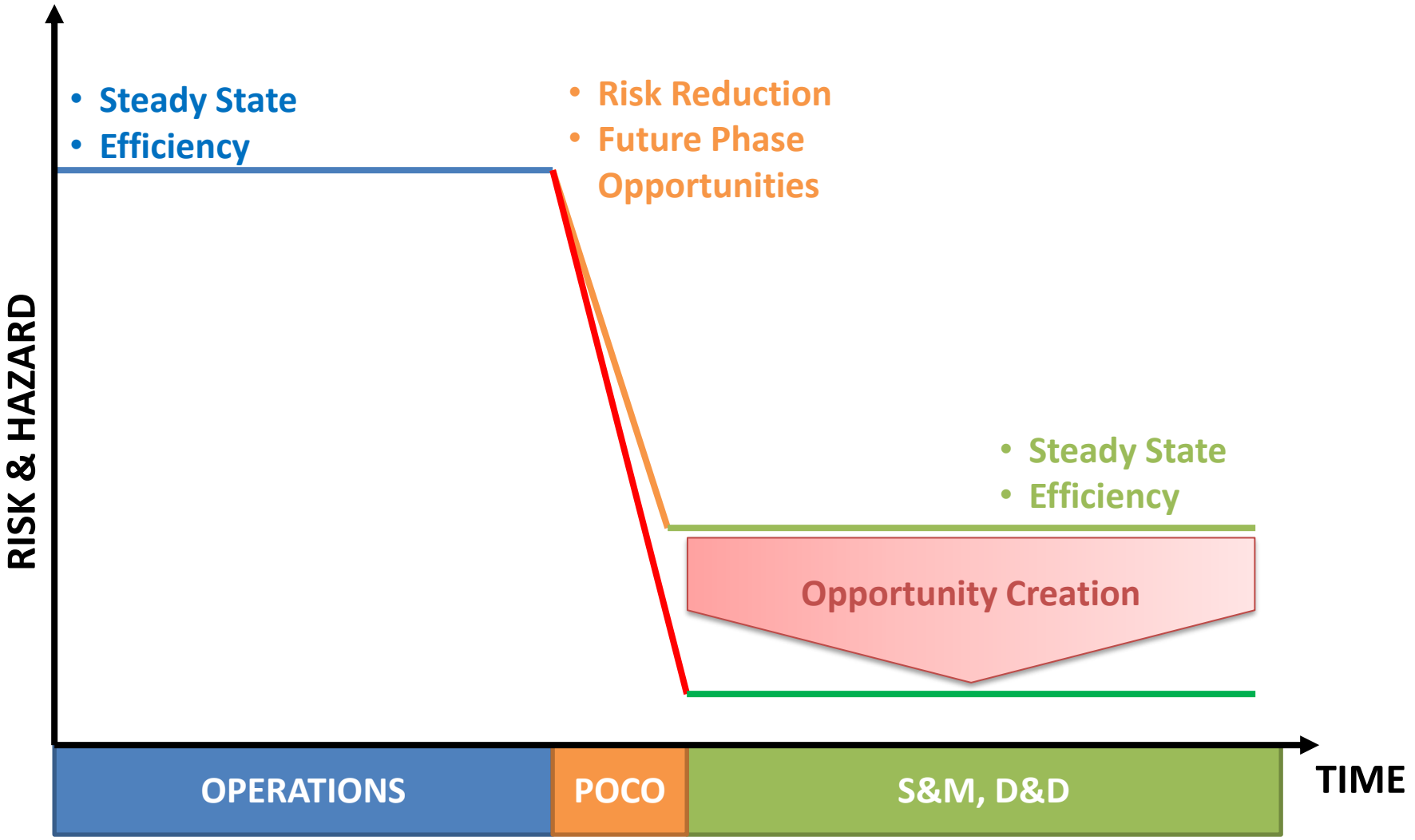
© Auke Visser's International Super Tankers

SELLAFIELD THE SUPERTANKER

- Incumbent workforce
- Routine plant cleaning techniques
- Existing waste processing methodologies
- Established processes
- Available waste routes

- Identify and deliver additional opportunities
- Utilise innovative cleaning & processing techniques
- Increase waste product value
- Improve lifetime cost

PHASE FOCUS



NOT TO SCALE

WHAT DOES THE CHANGE GIVE YOU?

Targeted washes and retrievals deliver:

- Further reduction in residual inventory
- Risk and hazard reduction
- Reduced surveillance & monitoring requirements
- Reduced care & maintenance burden
- Enables decommissioning & demolition
- Increased contact dismantling
- Pro-active application of the waste hierarchy
- Repurposing opportunities

But the cleanest solution is not necessarily the best option

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Appropriately Clean

What do I do with the waste product?

What do we intend to do with it in the end?

Am I going to use it for anything else?

How do I prove it is clean enough?

Do I have time to do this?

So, how clean do I want it?

Where do I get these solutions from?

How do I know when it is clean enough?

What am I trying to remove?

How confident am I that it will work?

Do I let it soak, if so how long for?

What else can I use to clean it?

Is it clean enough already?

How do I use it safely?

Who will tell me how to use it?

IMPLEMENTATION

- Enabling Pillars
  - Access
  - Clean-Out
  - Characterisation
  - Effluent & Waste
- Plant washes & material retrieval
  - Downstream effluent & treatment routes
  - Analytical capabilities
  - Knowledgeable operators
  - Process equipment & utilities in good condition
  - Effective Safety features (ventilation, etc.)
- These may not be available in the future
- Critical factors
  - Creation of a flexible toolkit
  - Deciding appropriate level of clean
  - Agile & empowered approach
  - Timing
  - Effective LfE

The Journey


Source: NuGen Consultation
Source: Bradwell Nuclear Power Station
Source: Pexels.com

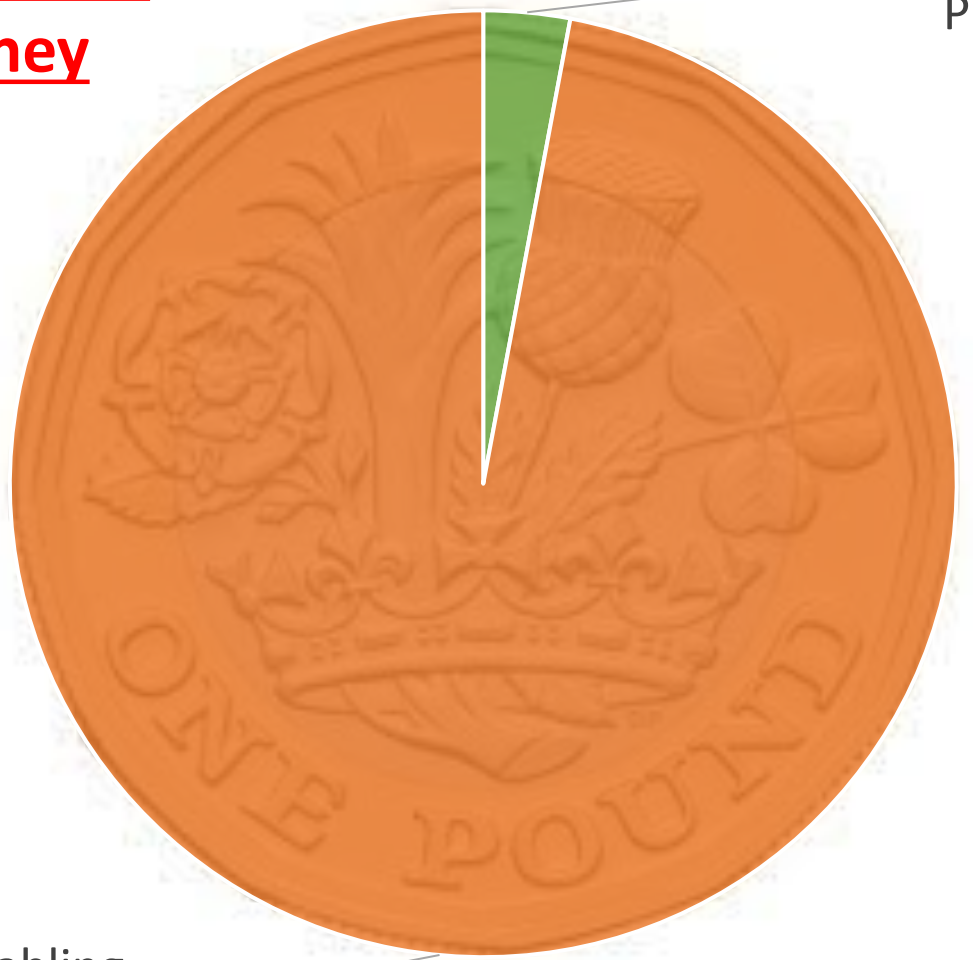
The Waste Product

The Contribution

Source: Pexels.com

The Autopsy Findings

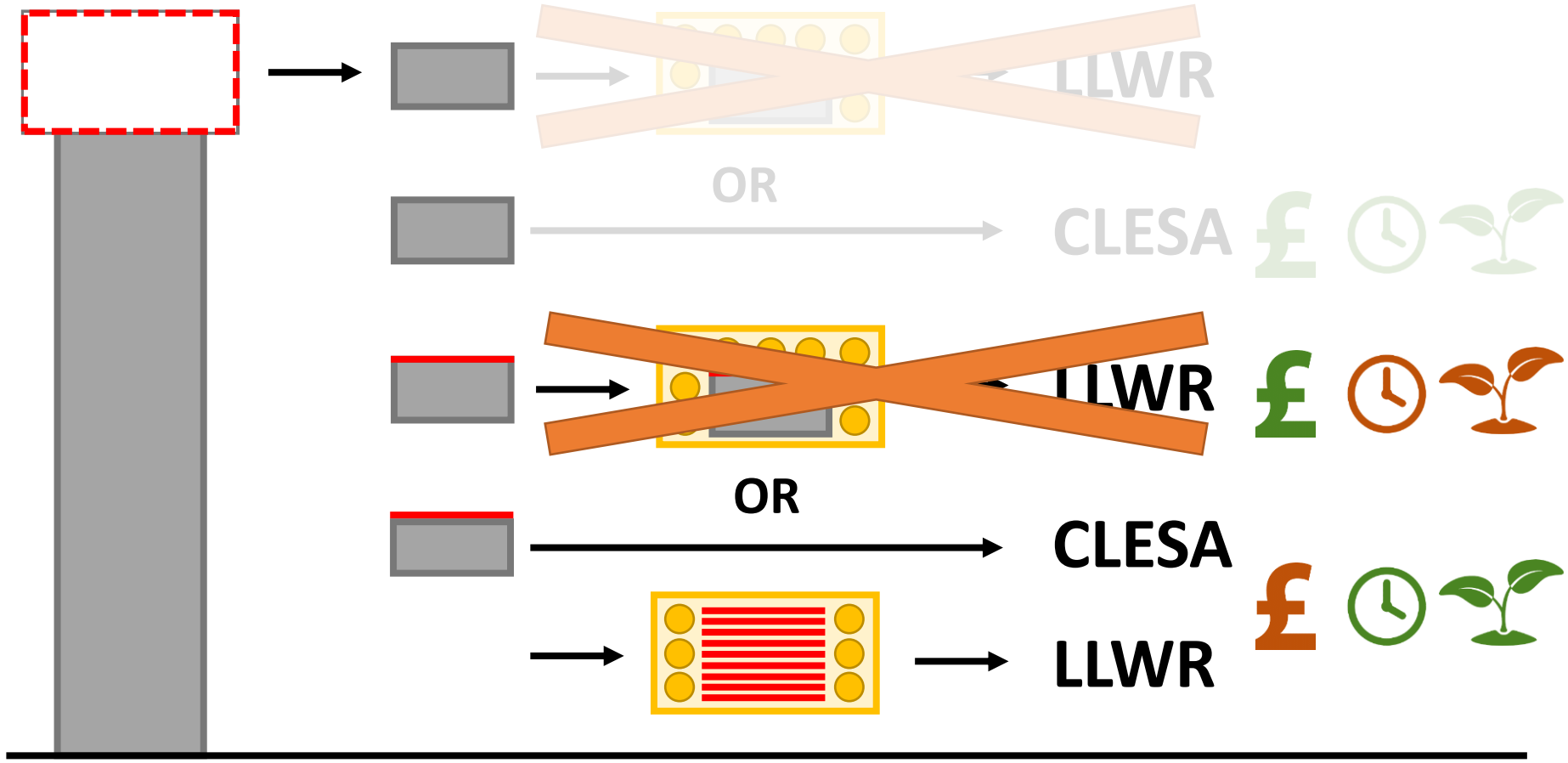
However it's not all about the money



Source: The Royal Mint

Value Is Not Just Cost:
Windscale Pile 1 Chimney Diffuser Blocks

Value Options:
Windscale Pile 1 Chimney Diffuser Blocks



Thermal Treatment Problem Statement

2019 Tiger Team (Sellafield, NDA and supply chain):

"The Sellafield & UK ambition for the thermal treatment of Higher Activity Wastes (HAW) is to process PCM, Pumpable (Sludge), MBGW and Bulk metals due to benefits such as significant volume reduction and waste passivation. This long-term ambition shall be demonstrated via a near term pilot production scale modular thermal capability located at the Sellafield site."

Creation of a Thermal Programme to develop three initial capabilities:

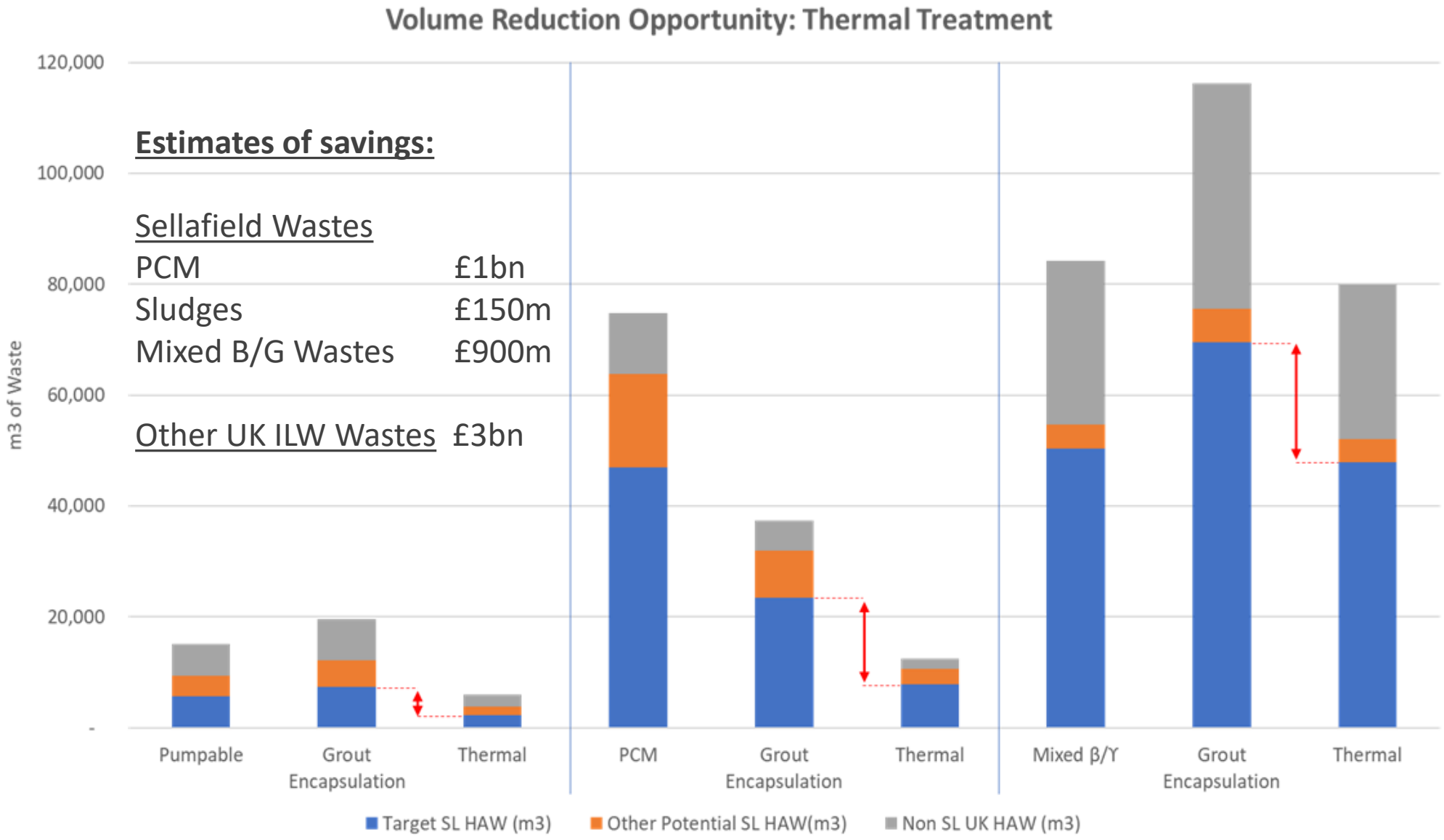
1. Pumpable wastes (sludges and ion exchange material)
2. PCM
3. Solid Mixed Beta Gamma Wastes (MBGW)

- Pumpable and MBGW pilots focus on addressing engineering and operational challenges
- PCM pilot focus on addressing the key technical challenges (scalability of criticality and radiological safety case)

Why thermal treatment?

- Achieves significant waste volume reduction compared to encapsulation resulting in far fewer conditioned waste packages to store and dispose.
- Vitrified products are inherently inert, high integrity, stable products which won't evolve during storage.
- Potential lifetime cost savings can be significant
- Provides capability to accept opportunity and/or problematic waste feeds.
- Greatly reduces the reliance on site wide shared infrastructure (e.g. SIXEP)
- Potential to develop a UK wide capability, significantly lowering the UK Decommissioning bill.

Why thermal treatment?




1) Lower volume of processed waste
2) Fewer containers filled
3) Fewer stores spaces/stores
4) Less reliance on existing and future infrastructure
5) Reduction in new build requirement
6) Less future raw waste
UK thermal treatment delivers a significant contribution to Nuclear Sector Deal
20% Cost reduction by 2030

The Golden Thread

Source: Pexels.com