UK Review of Magnox Reactor Decommissioning Strategy

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UK Decommissioning Strategy

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Magnox (Steel RPV)

Magnox (Concrete RPV)

Previous Magnox Decommissioning Strategy

Was DEFERRAL with planned interventions – long period.

Magnox decommissioning strategy

- Dose rates reduce significantly over the deferral period
- (simplifies handling and packaging of waste)
- (easier decommissioning)
- Radioactive decay will reduce the category of much of the waste
- Presence of long-lived radionuclides such as C-14 and Cl-36
- Interim storage of wastes is expensive and inefficient
- The cost of preparing a site for C&M and maintaining it in this state will be low and predictable.
- Costs of maintenance, security and other costs are less than the savings associated with deferral.

Bradwell at power

Bradwell turbine hall demolition

Bradwell turbine hall demolition

Not a nuclear issue

Bradwell site entering Care and Maintenance

Bradwell today

Bradwell learning

Asbestos finds in the Reactor Buildings and elsewhere

The condition of waste drums, tanks, vessels, vaults and their contents being different, often significantly from what was originally assumed

The degrading condition of the ageing plant having many impacts and requiring repair or alternative decommissioning techniques than had been assumed.

The underground conditions of the site being different to those expected based on site drawings

The quantities of waste to be processed being different to that assumed

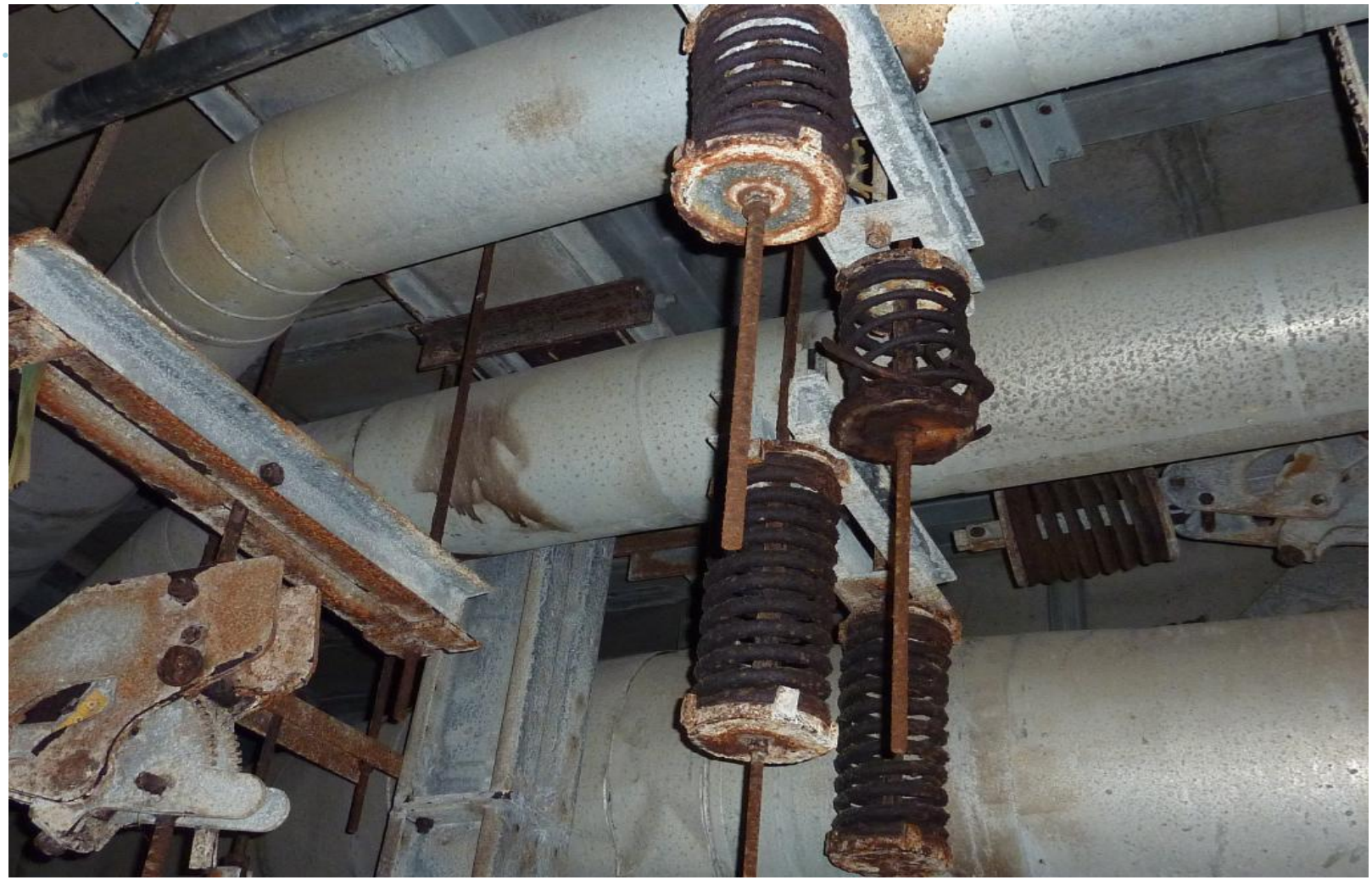
The opening up of areas of the site (e.g. void cells) that had never been accessed

The limited space on the Bradwell site in particular for waste storage and processing

Environmental conditions changing (e.g. nesting Peregrine Falcons and other birds, rainwater ingress)

The new technologies being deployed for the first time raising new challenges

Dungeness A evidence



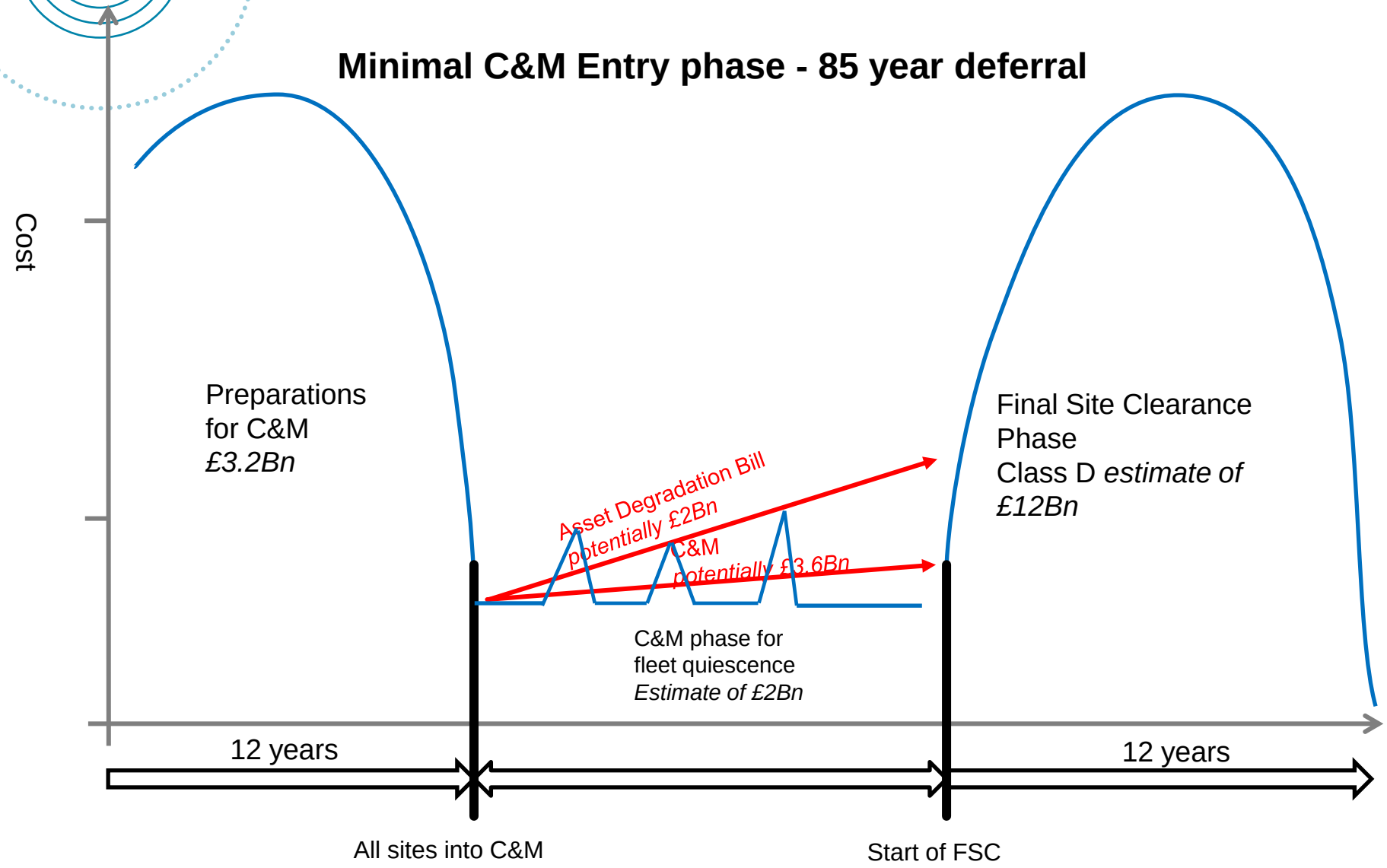
Dungeness A evidence

Dungeness A evidence

Trawsfynydd evidence

Dungeness A - more evidence

Previous Blanket Strategy for Magnox Reactors – real cost of asset degradation



Discriminatory Factors

Tier 1 factors	Example of value that could be delivered
Health and safety	• Does pace of decommissioning affect risk to workers (e.g. radioactive decay, radioactive ingrowth, structural safety, friability of asbestos, etc.)?
Risk / hazard reduction	• What risk does installation currently present to human health and the environment? Will this risk increase or decrease over time? • To what extent will decommissioning decrease the risk?
Security	• Does decommissioning of this installation change the security status of the site?
Environment	• Does pace of decommissioning change discharges to the environment, including the nature of waste arising (e.g. radioactive decay versus in-growth)
Socio-economic impact	• Does the pace of decommissioning affect local community or economy (e.g. maintaining employment opportunities for the local community)
Lifetime Cost	• What is the lifetime cost of different decommissioning strategies (including asset management and other controls)? • Is there potential for any income from decommissioning (e.g. land sale)?
Enabling the mission	• To what extent would decommissioning ○ develop skills and / or maintain a skilled workforce ○ provide lead and learn opportunities ○ create space for other high-priority work ○ provide an opportunity for testing a new approach or technology ○ demonstrate feasibility and increase confidence in decommissioning ○ set a helpful precedent? ○ Added Value generated

Constraints / Benefits realisation

Tier 1 factors	Constraints to be managed
Resources	• Is the best-performing strategy affordable (do funds exist)? • Do the skills exist to deliver the preferred strategy?
Logistics	• Is there adequate space to perform decommissioning? • Is the necessary waste infrastructure available? • Is decommissioning dependent on another facility?
Technology	• Does the necessary technology exist?
Contracts	• Is it feasible to contract for the preferred strategy
Policy and strategy	• Does the best-performing strategy align with policy, regulation and NDA strategy?
Stakeholder support	• Will interested parties support or block the preferred strategy?

Evidence required by SLCs

Establish the current risk presented by installation to people and environment

Asset health – estimate of effort required to maintain safety and manage emissions

How does dose to workers change over time

How do waste volumes change over time (radioactive decay, ingrowth, etc.)

What is the nature of the hazard - what POCO completed (residual inventory) etc

Constraints and how these have affected scope of review;

- Space
- Do not increase licensed site perimeter
- Waste solutions
- Stakeholder views ie regional waste stores

Development of decommissioning strategies

1. **Do not defer**
2. **Defer with minimal interventions.**

Ensuring the deferral period is preceded by the removal of those structures and fabric which are expected to decay or deteriorate during deferral. Could be delivered by taking a reactor back to a smaller solid internal structure such as a bioshield. This approach requires more effort to be expended at the start of the programme. It is likely that a short deferral period generally would not warrant significant work to precede the decommissioning phase

3. **Defer with planned interventions.**

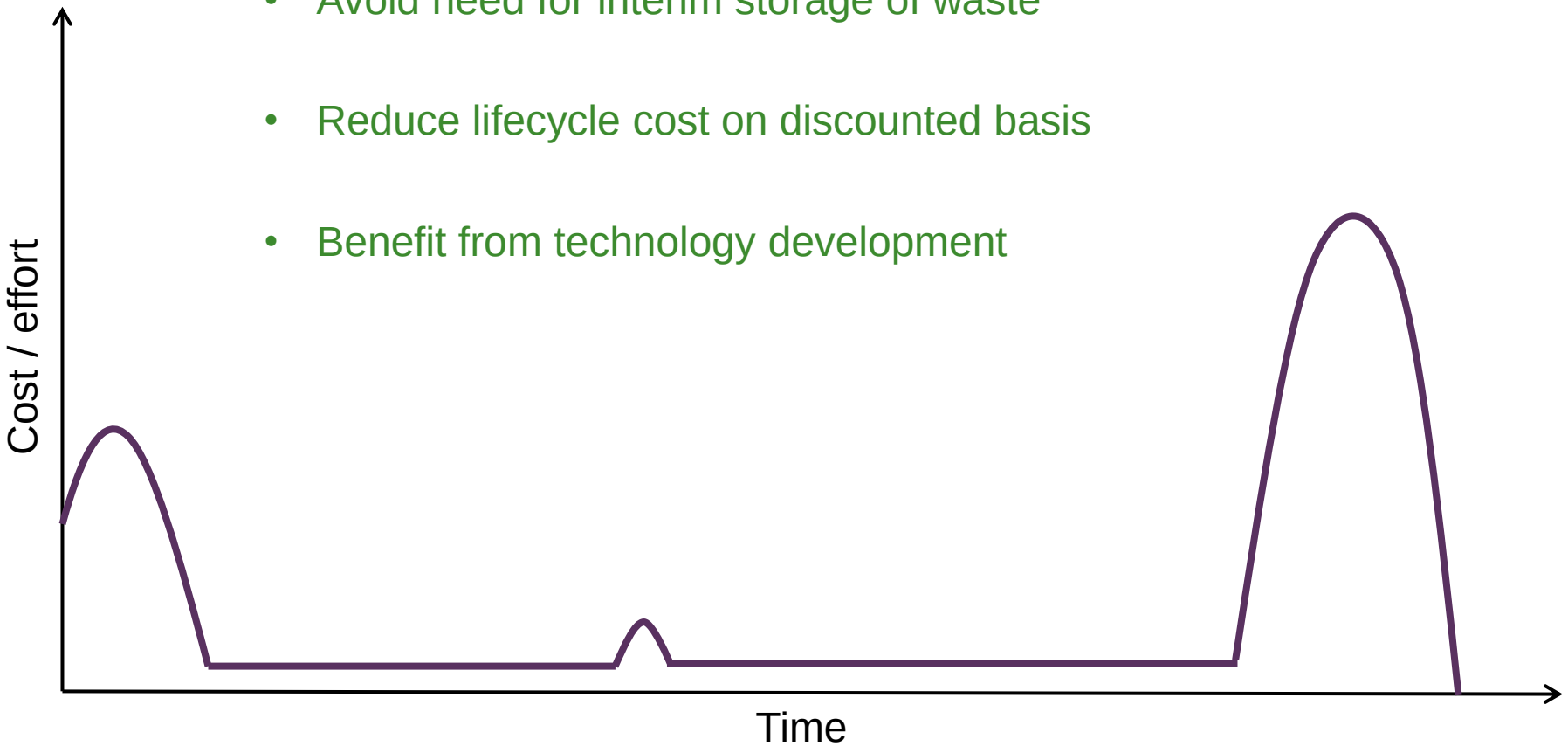
Assumes a significant maintenance programme of work being required during the deferral period itself, offset by much less work being required during the preparatory phase

For a short (10-15 years), medium (15-25 years) or long (25+ years)

Benefits of deferral

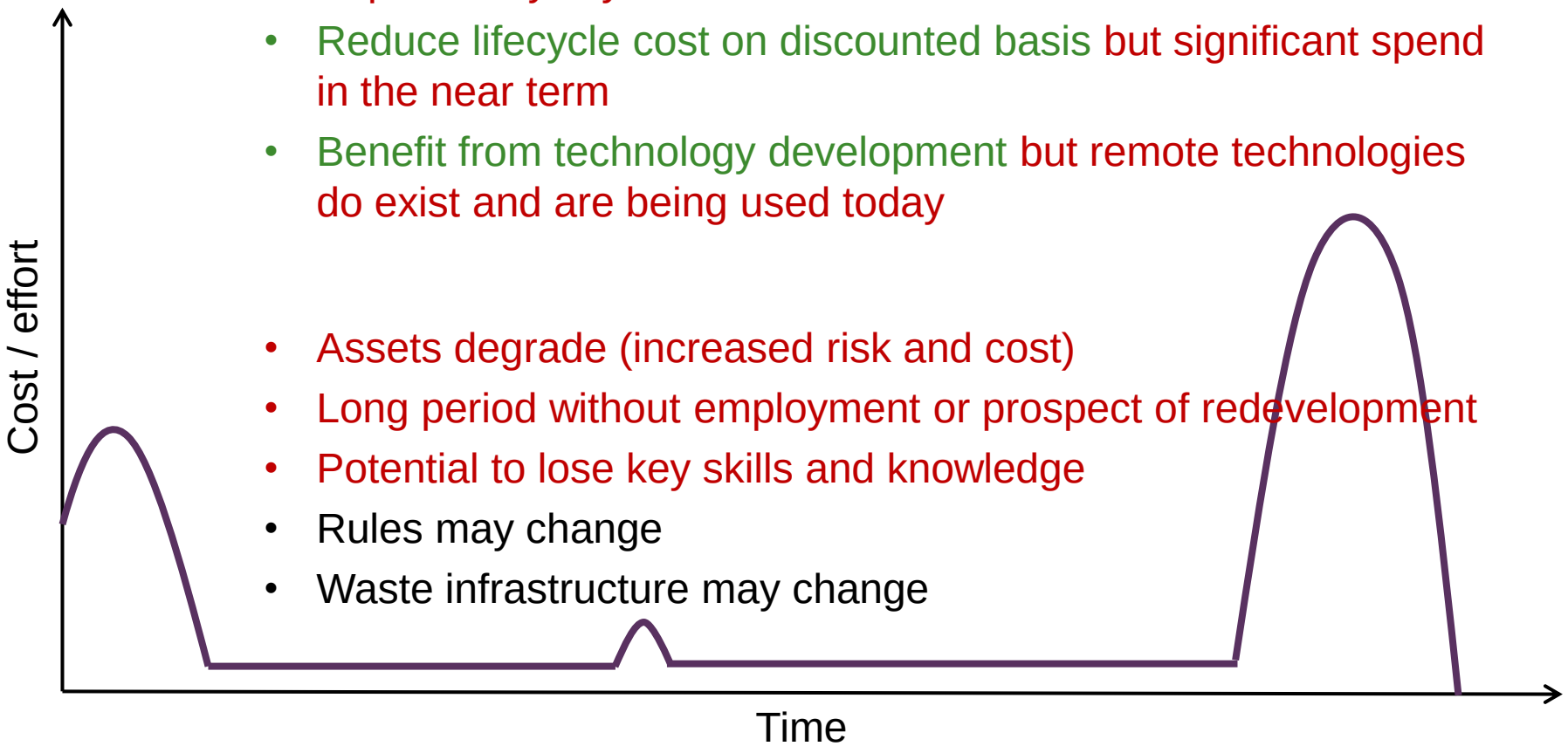
1. Deferred decommissioning - defer reactor dismantling to:

- Benefit from radioactive decay
- Avoid need for interim storage of waste
- Reduce lifecycle cost on discounted basis
- Benefit from technology development



Dis-benefits of deferral

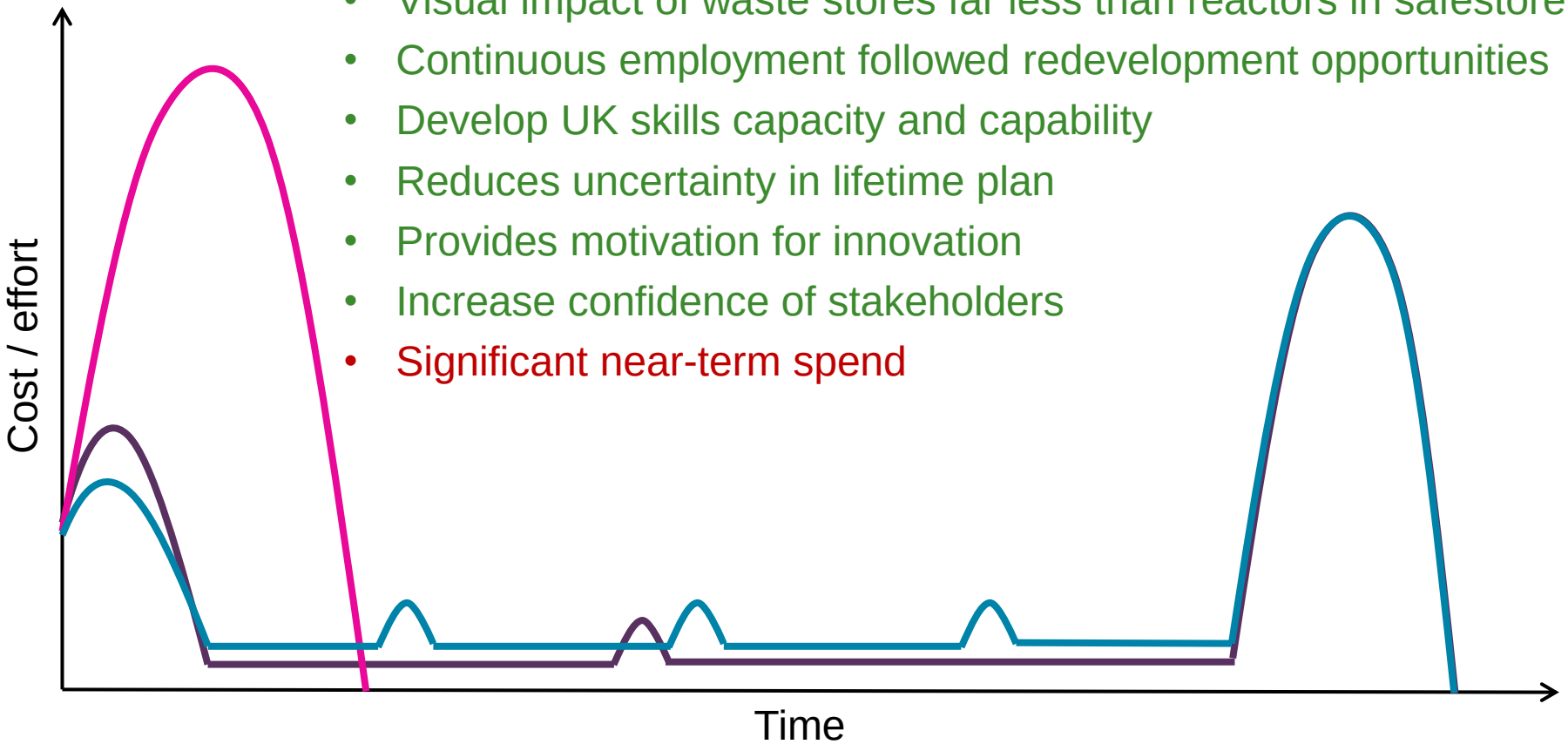
- Benefit from radioactive decay but long-lived radionuclides minimise benefit
- Avoid need for interim storage of waste but storage will be required anyway for transfer to GDF
- Reduce lifecycle cost on discounted basis but significant spend in the near term
- Benefit from technology development but remote technologies do exist and are being used today



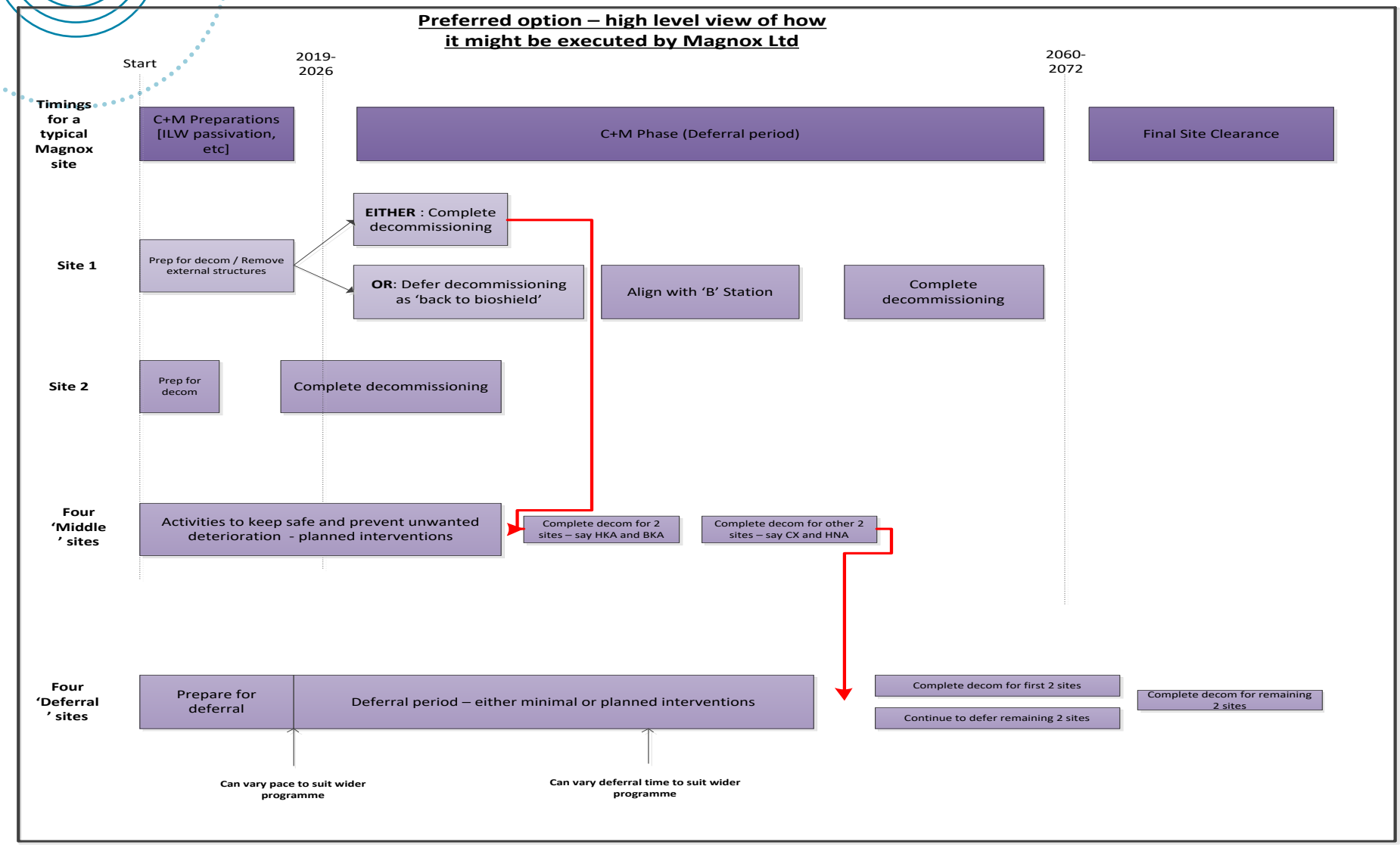
- Assets degrade (increased risk and cost)
- Long period without employment or prospect of redevelopment
- Potential to lose key skills and knowledge
- Rules may change
- Waste infrastructure may change

Dis-benefits and benefits of early decommissioning (continuous)

- Remote working required but would be required for ALARP
- Plant in a known state with minimal asset degradation
- Interim store will be required but required for geological disposal
- Visual impact of waste stores far less than reactors in safestore
- Continuous employment followed redevelopment opportunities
- Develop UK skills capacity and capability
- Reduces uncertainty in lifetime plan
- Provides motivation for innovation
- Increase confidence of stakeholders
- Significant near-term spend



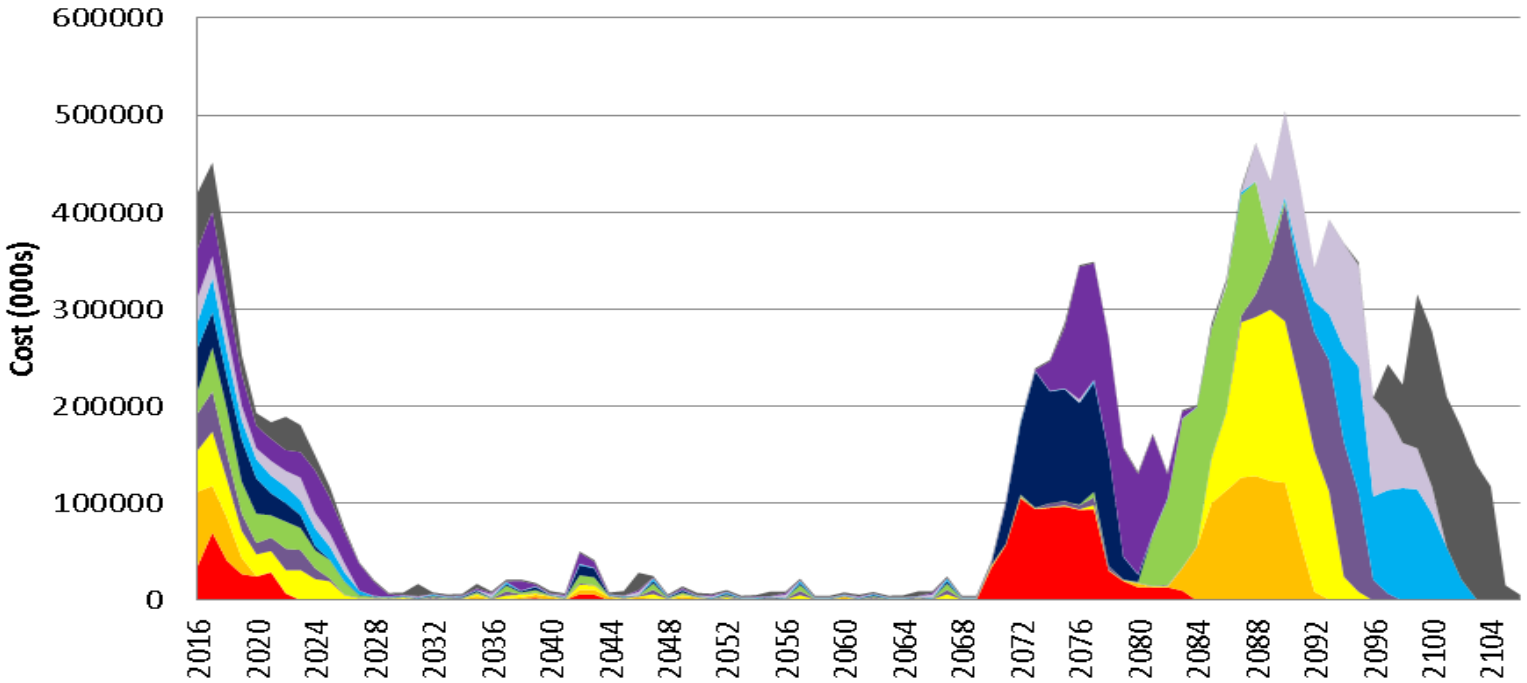
Chosen approach



Applying deferred strategy to all sites

Deferred decommissioning as a blanket strategy

- Loss of skills and corporate knowledge in SLCs and regulators
- Significant remobilisation challenges
- Stakeholder perception



Continuous rolling programme