The Future of Sellafield

POCO, Programmes & Partnerships

26th June 2019

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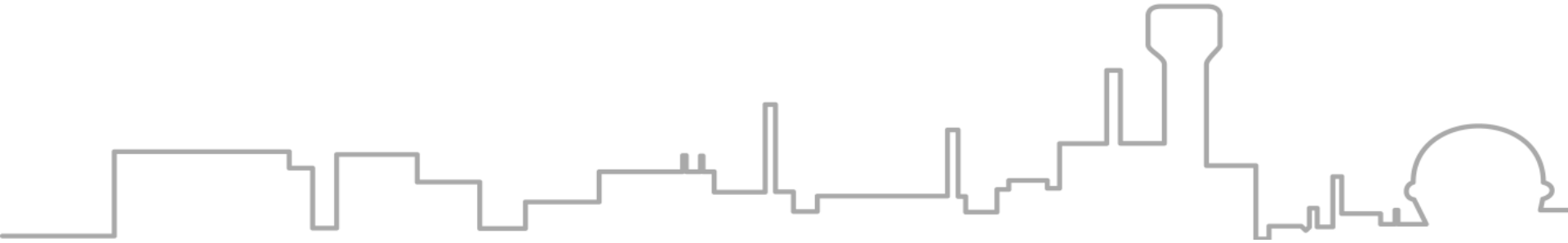
Head of Beta/Gamma Remediation



The Journey

- The Sellafield Super Tanker
- POCO: When is it clean enough?
- Programmes: How do you eat an elephant?
- Partnerships: Climbing Everest

Sellafield Context

- Covers 6 square kilometres
- Spend £2B every year
- NDA subsidiary since 2016
- Over 10,000 staff
- Home to more than 200 nuclear buildings
- £117.4B remaining cost of decommissioning and clean-up (£160.7B UK total) (2015/16 estimate)
- Largest inventory of untreated nuclear waste in the world
- Home to 4 of the biggest nuclear risks and hazards in Europe
- More than 4,000 supply chain experts help our employees
- Reprocessing, storage and decommissioning

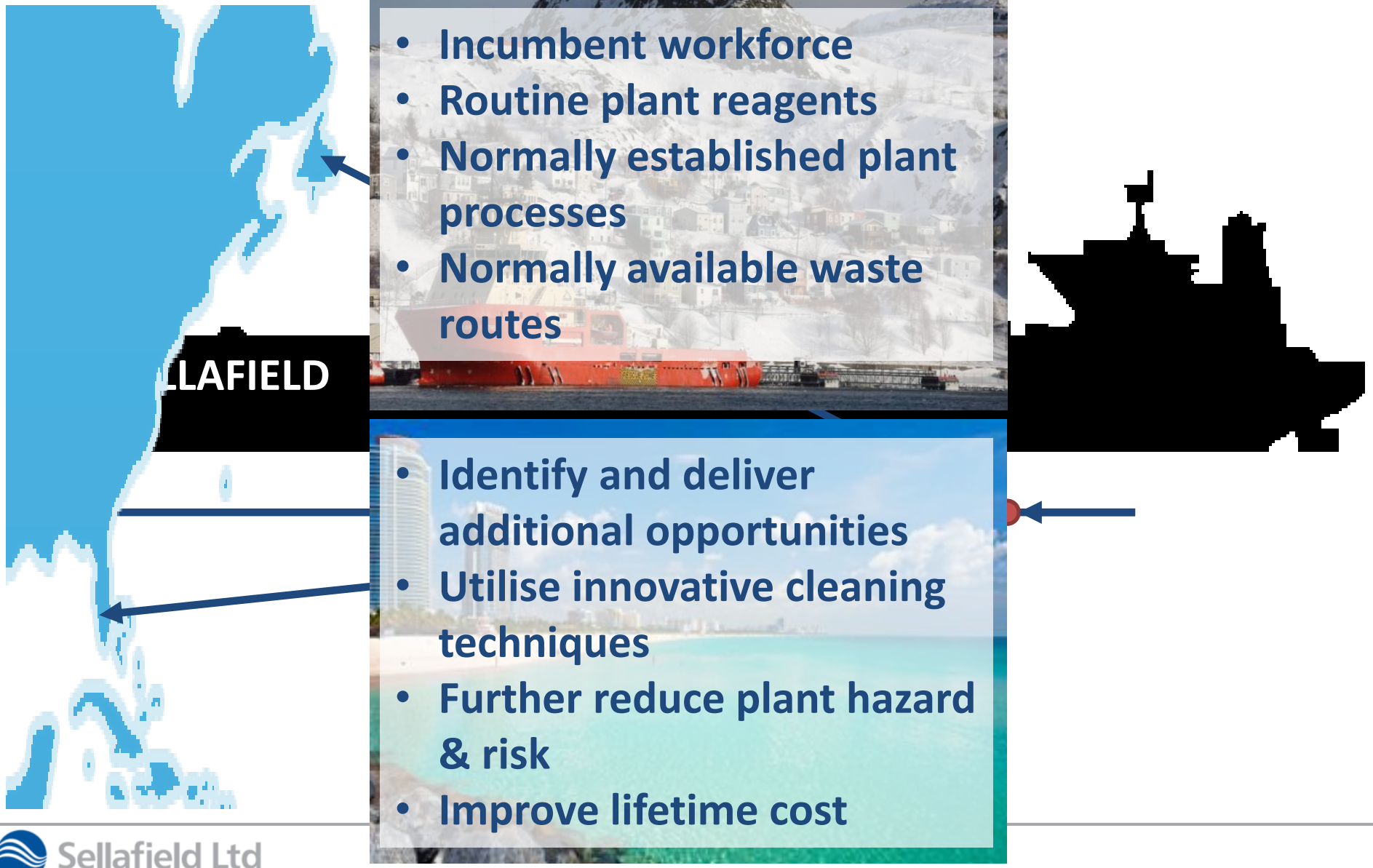
Context – Major Plants

- First Generation Magnox Storage Pond (FGMSP)
- Windscale Advanced Gas Cooled Reactor (WAGR)
- Enhanced Actinide Removal Plant (EARP)
- Thermal Oxide Reprocessing Plant (THORP)
- Highly Active Liquor Evaporation and Storage (HALES)
- Waste Vitirification Plant (WVP)
- Sellafield MOX Plant (SMP)
- Radioactive waste stores
- Fellside Power Station
- NNL Central Laboratory
- Calder Hall nuclear power station
- Windscale Piles
- First Generation Reprocessing Plant
- Magnox Reprocessing Plant

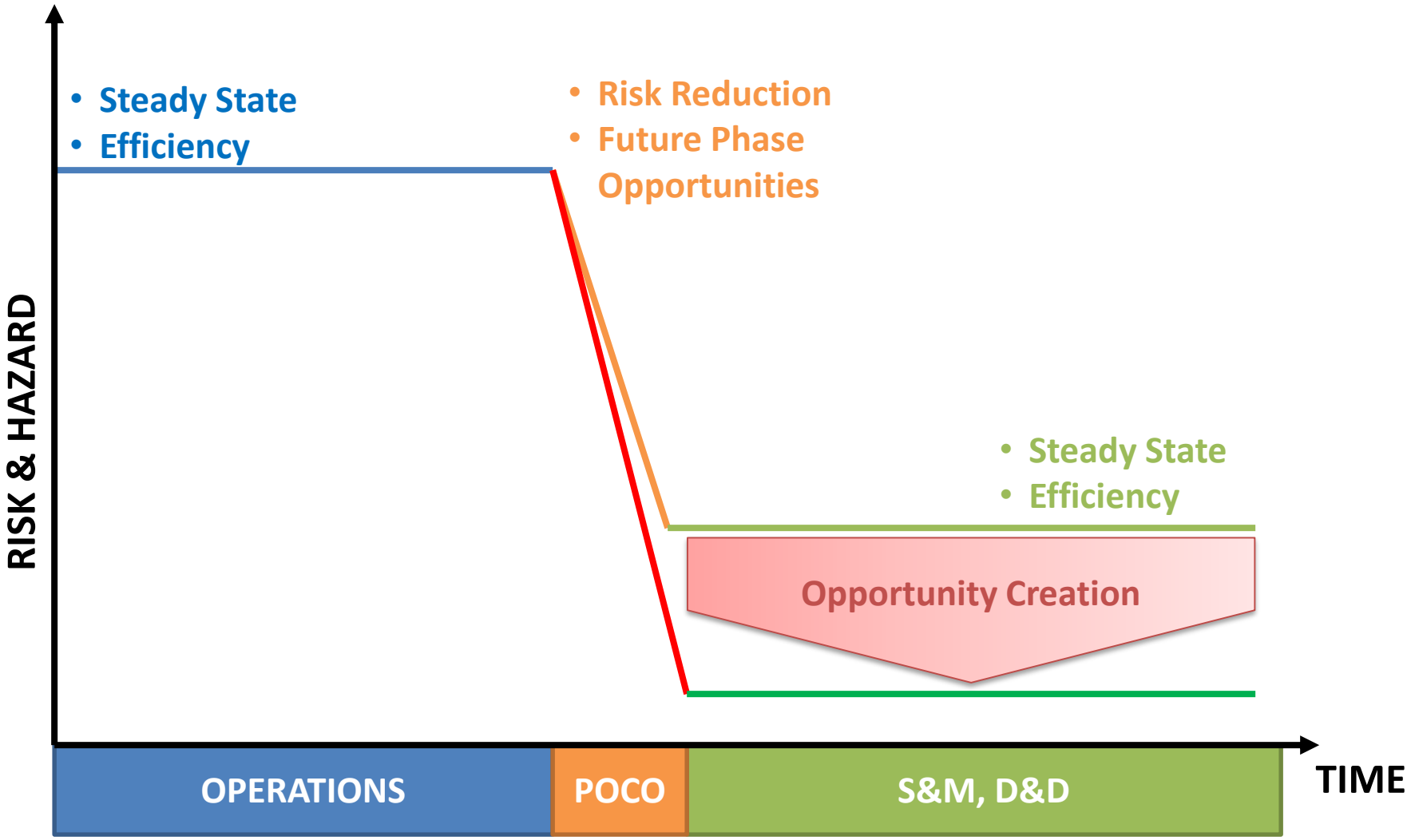
BEING A SUPERTANKER ISN'T ALL BAD

© Auke Visser's International Super Tankers

SELLAFIELD THE SUPERTANKER



PHASE FOCUS



NOT TO SCALE

WHAT DOES THE CHANGE GIVE YOU?

Targeted washes and retrievals deliver:

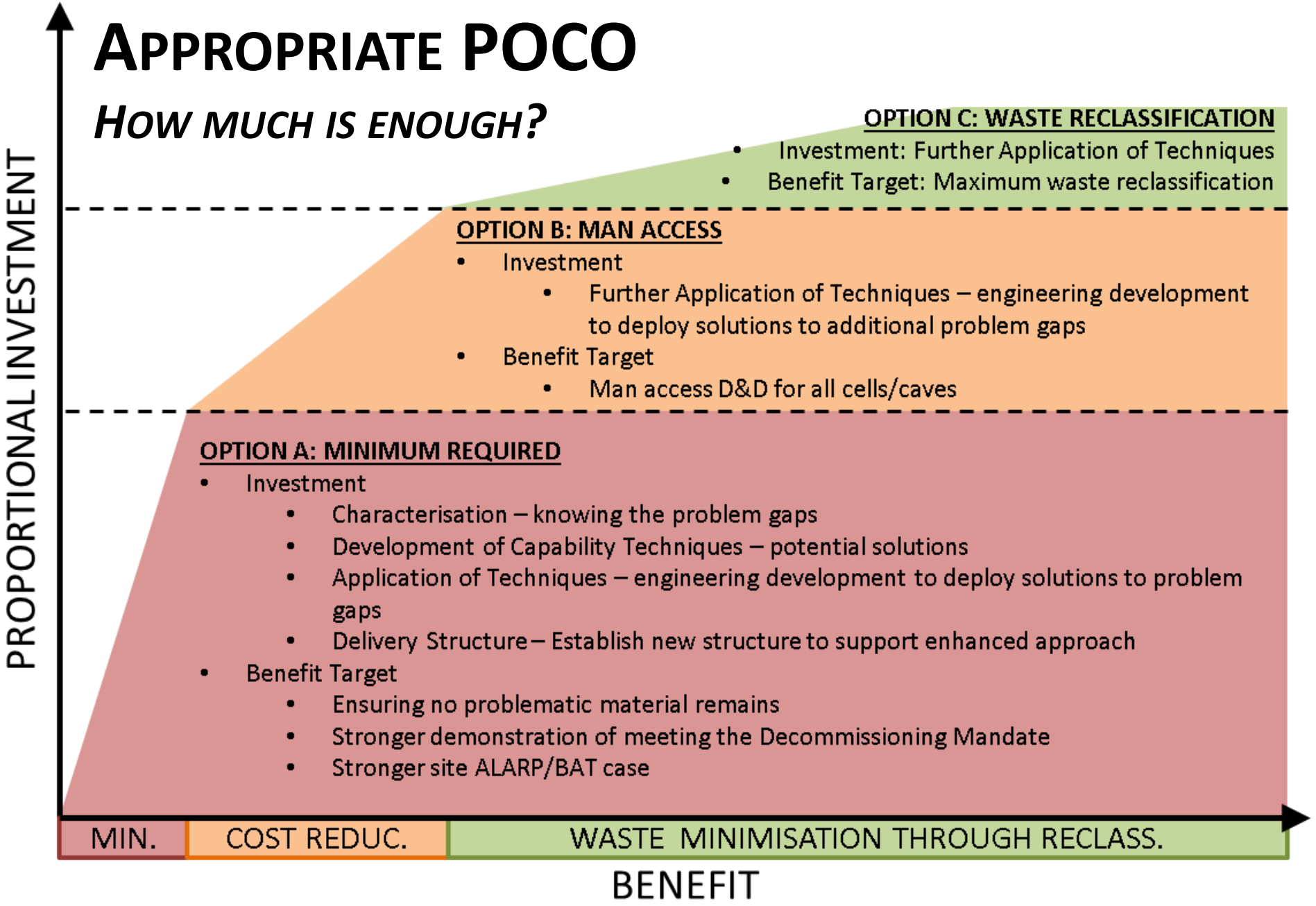
- Further reduction in residual inventory
- Risk and hazard reduction
- Reduced surveillance & monitoring requirements
- Reduced care & maintenance burden
- Enables decommissioning & demolition
- Increased contact dismantling
- Pro-active application of the waste hierarchy
- Repurposing opportunities

But the cleanest solution is not necessarily the best option


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?
Appropriately Clean
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?

APPROPRIATE POCO

HOW MUCH IS ENOUGH?



NOT TO SCALE / EXAMPLE ONLY

Assessment Criteria

- Strategic objectives alignment
  - Repurposing
  - Interim/End State
- Waste and effluent limits
- ALARP/BAT
- Good value
- Affordable
- Available Techniques

IMPLEMENTATION

- Peer Learning
- Organisation Evolution
  - Full lifecycle vision
  - Adapting support functions (analytical services, effluent treatment, waste management) to POCO needs
  - Managing new & evolving risks
- Enabling Pillars
  - Access
  - Characterisation
  - Clean-Out
  - Effluent & Waste
- Decision Making
- Agile & Empowered Delivery

Facility Requirements

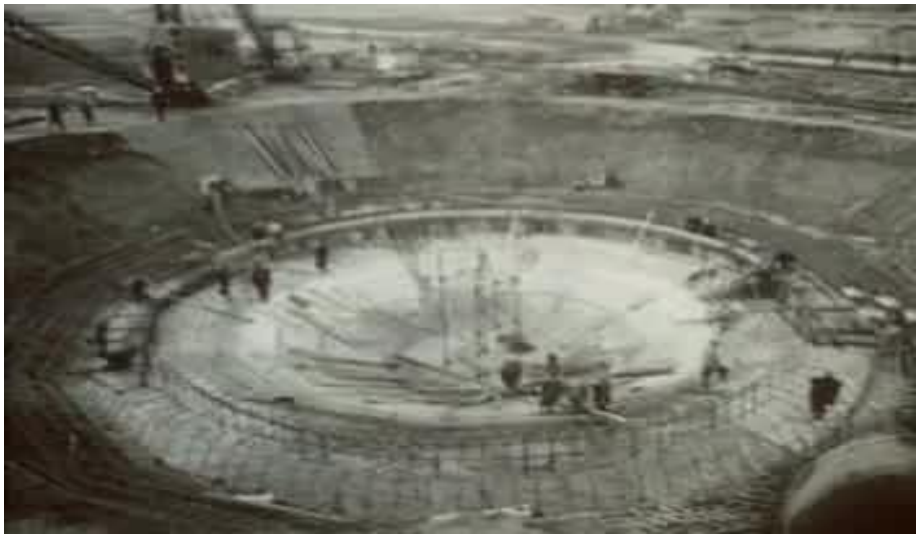
- Plant washes
  - Downstream effluent routes
  - Analytical capabilities
  - Knowledgeable operators
  - Process equipment in good condition
  - Effective Safety features (ventilation, etc.)
- External material retrieval
  - Treatment route (dissolution, extraction, etc.)
  - Plant utilities in good condition
  - Effective Safety features (ventilation, etc.)
- These may not be available in the future

POCO Summary

- POCO is a key turning point in enabling both basic delivery & opportunities for late lifecycle phases
- Doing minimal POCO without challenge/assessment limits delivery in decades to come
- Critical factors:
  - Creation of a flexible toolkit
  - Deciding appropriate level of clean
  - Timing
  - Agile & empowered approach
  - Effective LFE
- Doing an appropriate level of POCO is a significant element in delivering the overall SL mission

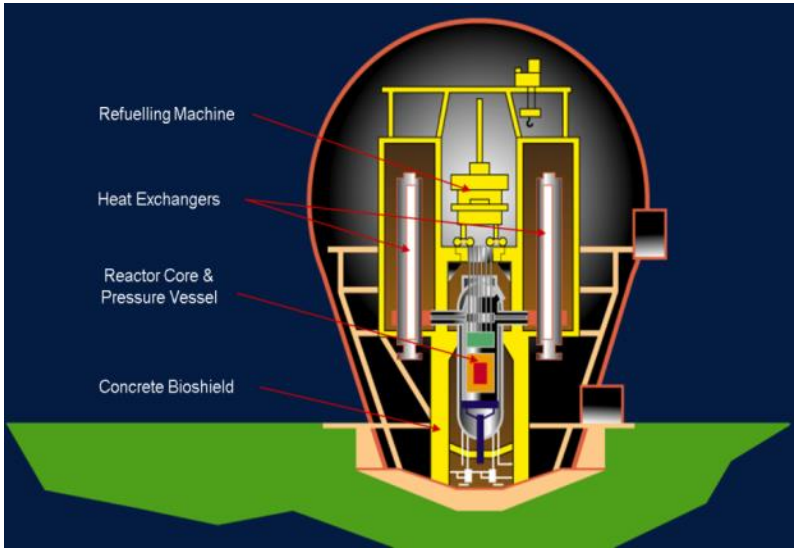
Programmatic Case Study: Windscale Advanced Gas-Cooled Reactor (WAGR)

- UK's prototype civil AGR
- Forerunner of fourteen full scale AGRs in UK at seven sites
- CO_2 cooled, graphite moderated reactor
- Constructed 1957-1961
- Achieved full output in 1963
- Electrical output of 33MW (E) for 18 years
- Shut down in 1981 having achieved all its objectives



DECOMMISSIONING HISTORY

1981	Reactor shutdown
1981 - 1983	Fuel removal
1984 - 1988	Waste Route Constructed
1989 - 1990	Refuelling machine dismantled
1990 - 1992	Reactor top biological shield and pressure vessel top dome removed
1993 - 1994	Remote Dismantling Machine installed and ILW store constructed
1994 - 1995	Four 190 tonne heat exchangers removed
1996 - 1998	Non-active commissioning of equipment
1999 – 2011	Removal of reactor core and pressure vessel in 10 campaigns



The plant when shutdown 1981

Neutron Shield

Core Block and Spigot Ring Removal

Wall Plate Removal

Thermal Column Top Plate Removal

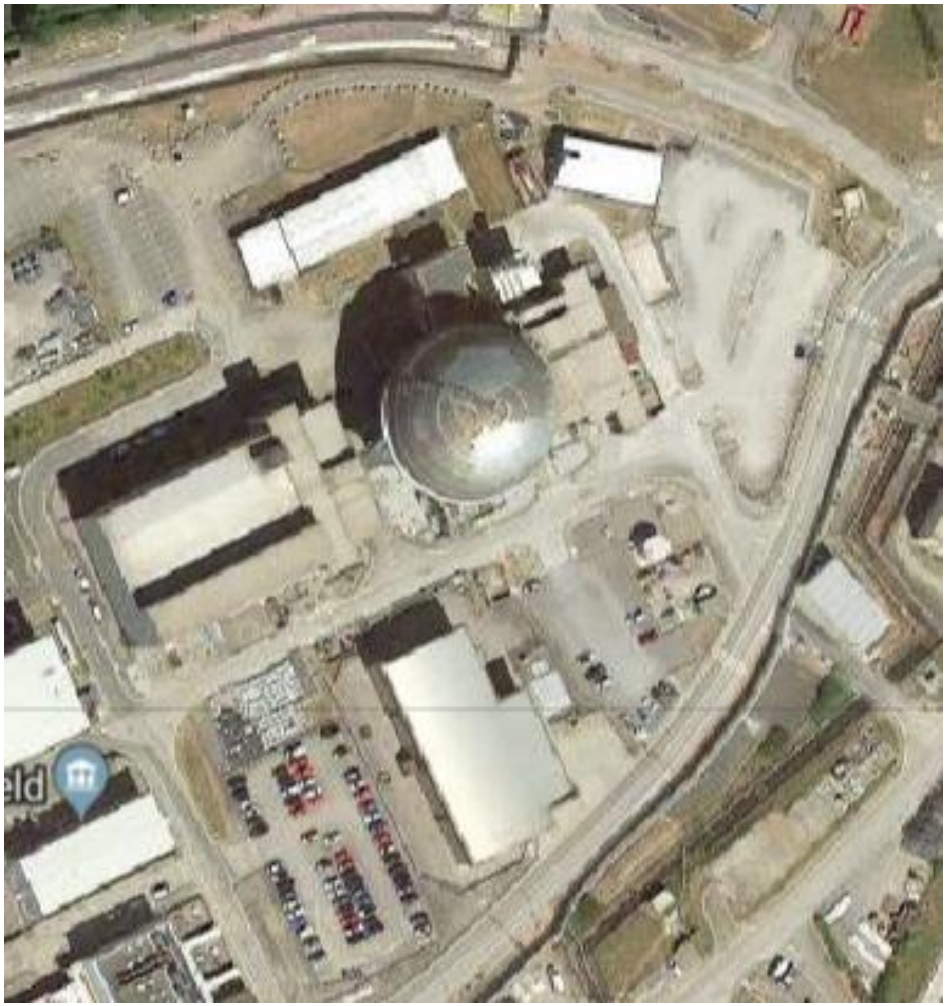
Intermediate Level Waste is stored

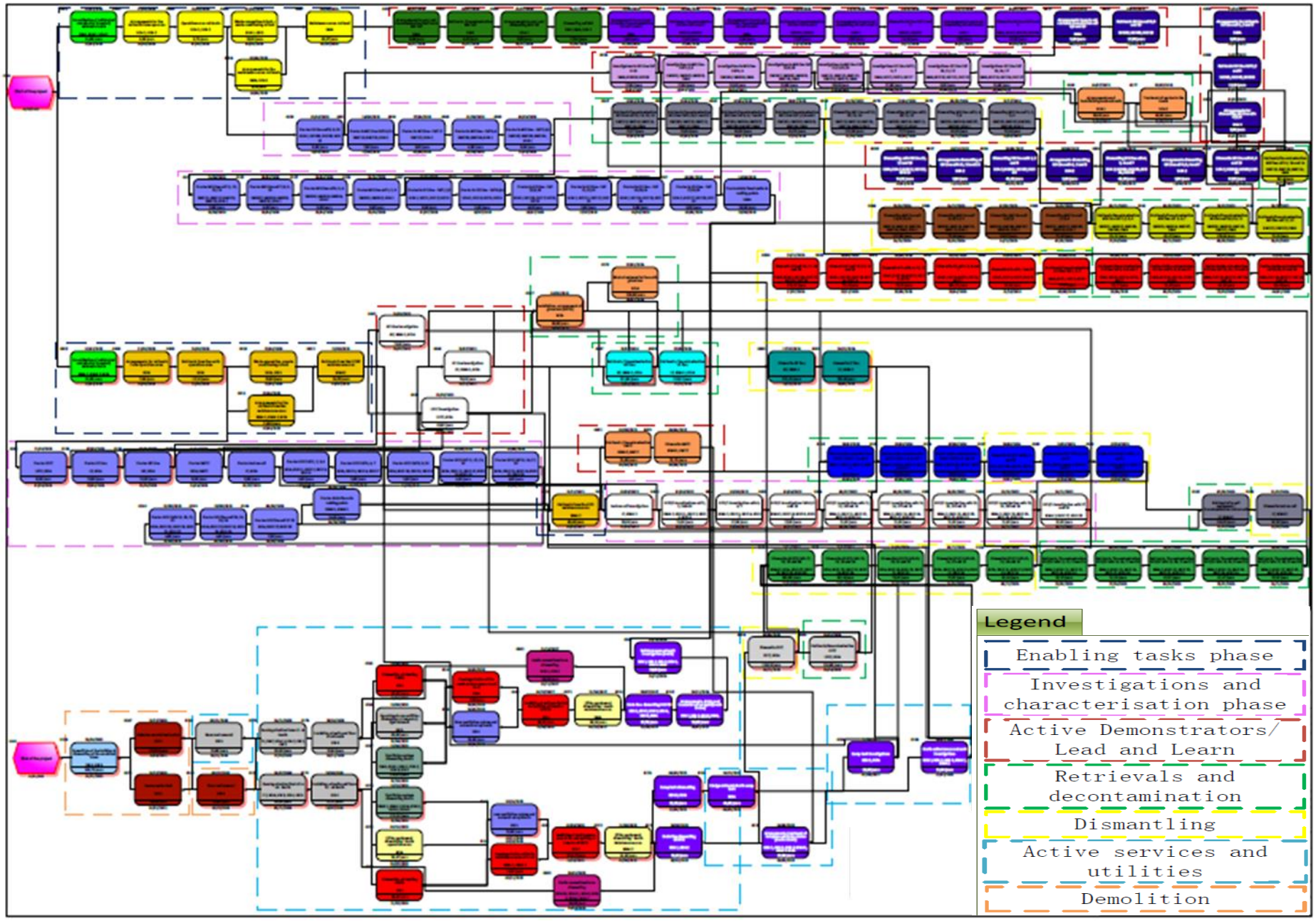
WAGR Future

- 2012 Final WAGR decommissioning & demolition postponed in order to focus the efforts on higher hazard projects
- Facility placed under a Surveillance and Maintenance regime
- Work to restart the decommissioning was initiated in 2018
- Expectation that many of the original concepts will no longer be suitable or available

THE PROGRAMMATIC APPROACH

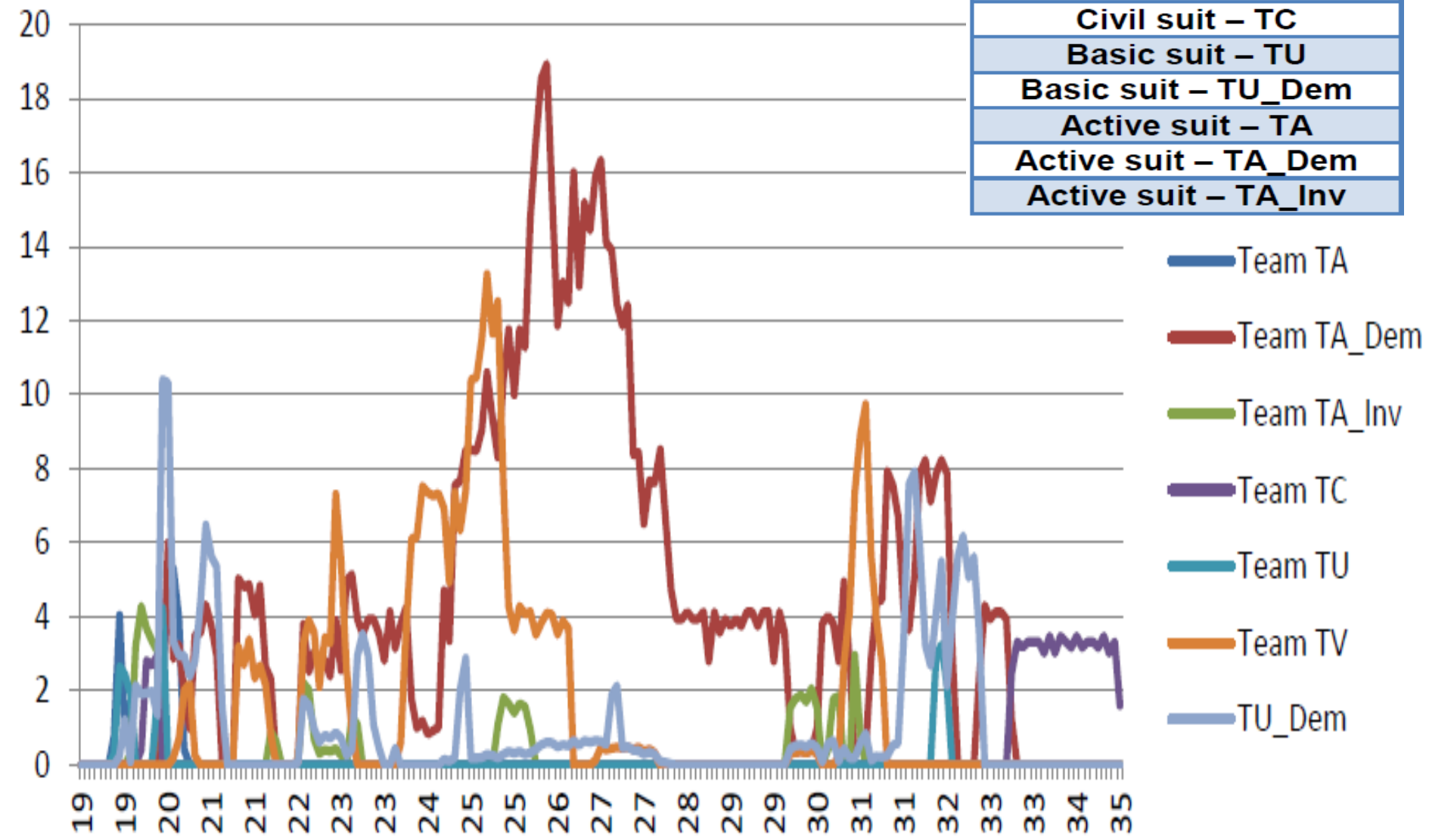
- Funding restricted to a project-style approach
- Project “salami slicing” not permitted
- Alternative “small bite” approach needed
- Reduce uncertainty
- Address higher hazards
- Create options - agility
- Realise savings throughout lifecycle



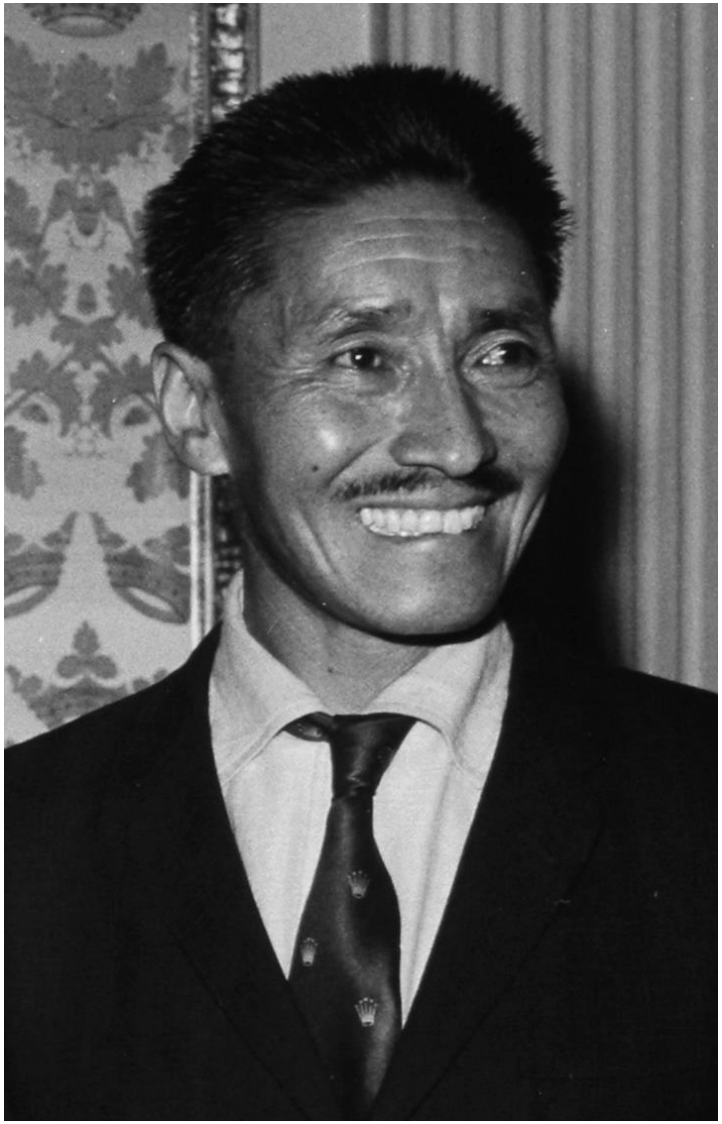

Legend
Enabling tasks phase
Investigations and characterisation phase
Active Demonstrators/ Lead and Learn
Retrievals and decontamination
Dismantling
Active services and utilities
Demolition

Blue Collar Flux per Suit Type

Type of suit
Ventilated suit – TV
Civil suit – TC
Basic suit – TU
Basic suit – TU_Dem
Active suit – TA
Active suit – TA_Dem
Active suit – TA_Inv



PARTNERSHIPS



DECOMMISSIONING DELIVERY PARTNERSHIP (DDP)

- Vision: To make DDP the framework of choice by delivering risk and hazard reduction through a robust and collaborative partnership
- Long-term partnership framework
- Tasks, minor projects, major projects
- 6 Lot Delivery Partners (LDPs) under 3 Lots

Lot 1

ADAPT
AREVA Doosan Atkins Project Team

ids
INTEGRATED DECOMMISSIONING SOLUTIONS

cnsl cumbria nuclear solutions ltd

nexus

Lot 2

TDA
The Decommissioning Alliance

Lot 3

i3 DECOMMISSIONING PARTNERS
Integrate Innovate Improve

BENEFIT DELIVERY IS AT OUR CORE

Benefits	***Intent***
1. Improved Schedule Delivery	Beat key project dates [pertaining to risk and hazard reduction], including KDMs
2. Effective Planning of Work	Efficient deployment of the supply chain
3. Timely Access to SQEP Resources	Effective and efficient deployment of resources in order provide paths of employment
4. Right 1st Time Technical Solutions	Help all partners avoid abortive "solutions"
5. Increased Supply Chain Innovation	Early engagement of the supply chain to provide and deliver innovative solutions

Bottom Line:
DDP Value for Money = Delivering these Benefits

PROGRAMME AND PROJECT PARTNERS (PPP)

- Vital role in the transformation of Sellafield
- Help drive a culture change in the business
- Key enabler for the Sellafield Ltd environmental remediation mission
- Create a legacy that goes beyond world class project delivery

PPP – What's next?

Supplier Relationship Management

Strategically planning for, and managing, all interactions with third party organisations that supply goods and/or services to an organization to maximize the value of those interactions

- Systematic, enterprise-wide assessment of suppliers' assets and capabilities
- Develop mutually beneficial relationships to deliver greater levels of innovation and competitive advantage
- Build trust: consistency of approach and defined set of behaviours
- Active replacement of policies and practices that impede collaboration and limit the potential value
- Creates closer, more collaborative relationships with key suppliers
- Uncover and realise new value while reducing failure risk

Supplier Relationship Management

Components of SRM

- Organizational structure
- Governance
- Joint activities
- Value measurement
- Systematic collaboration
- Technology and systems

Challenges

- Creating the business cases
- Executive sponsorship
- Calculating ROI
- Developing an SRM sales pitch
- Finding vendors who have SRM capabilities

My Ask…

- Think about the state facilities are left in at the end of operations
  - Will this offer the opportunities to deliver late life phases and optimum value?
  - If not, what else could be done immediately following operations while the routes still exist?
- Think of the scale of some of your larger decommissioning projects
  - Can you trust your lifetime plans to not change?
  - If not, is investing more resources at the start the right thing to do?
- Think of the skills you need to complete your mission
  - Do you have everything you need?
  - If not, where/how will you get them to the benefit of your organisation/industry/region?