The Future of Sellafield

POCO, Programmes & Partnerships

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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

- Incumbent workforce
- Routine plant reagents
- Normally established plant processes
- Normally available waste routes

- Identify and deliver additional opportunities
- Utilise innovative cleaning techniques
- Further reduce plant hazard & risk
- Improve lifetime cost
Phase Focus

- Steady State
- Efficiency

- Risk Reduction
- Future Phase Opportunities

Opportunity Creation

Operations
POCO
S&M, D&D

RISK & HAZARD

TIME

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

© Orano
What is “appropriately” clean?
Am I going to use it for anything else?

So, how clean do I want it?

How do I know when it is clean enough?

What else can I use to clean it?

How do I use it safely?

What do I do with the waste product?

How do I prove it is clean enough?

Where do I get these solutions from?

How confident am I that it will work?

Is it clean enough already?

What am I trying to remove?

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

Who will tell me how to use it?

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

Do I have time to do this?

How confident am I that it will work?

Who will tell me how to use it?
**APPRIOPRIATE POCO**

**HOW MUCH IS ENOUGH?**

**OPTION A: MINIMUM REQUIRED**
- Investment
  - Characterisation – knowing the problem gaps
  - Development of Capability Techniques – potential solutions
  - Application of Techniques – engineering development to deploy solutions to problem gaps
  - Delivery Structure – Establish new structure to support enhanced approach
- Benefit Target
  - Ensuring no problematic material remains
  - Stronger demonstration of meeting the Decommissioning Mandate
  - Stronger site ALARP/BAT case

**OPTION B: MAN ACCESS**
- Investment
  - Further Application of Techniques – engineering development to deploy solutions to additional problem gaps
- Benefit Target
  - Man access D&D for all cells/caves

**OPTION C: WASTE RECLASSIFICATION**
- Investment: Further Application of Techniques
- Benefit Target: Maximum waste reclassification

**PROPORTIONAL INVESTMENT**

**BENEFIT**

**MIN.**

**COST REDUC.**

**WASTE MINIMISATION THROUGH RECLASS.**

*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
• CO₂ 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1981</td>
<td>Reactor shutdown</td>
</tr>
<tr>
<td>1981 - 1983</td>
<td>Fuel removal</td>
</tr>
<tr>
<td>1984 - 1988</td>
<td>Waste Route Constructed</td>
</tr>
<tr>
<td>1989 - 1990</td>
<td>Refuelling machine dismantled</td>
</tr>
<tr>
<td>1990 - 1992</td>
<td>Reactor top biological shield and pressure vessel top dome removed</td>
</tr>
<tr>
<td>1993 - 1994</td>
<td>Remote Dismantling Machine installed and ILW store constructed</td>
</tr>
<tr>
<td>1994 - 1995</td>
<td>Four 190 tonne heat exchangers removed</td>
</tr>
<tr>
<td>1996 - 1998</td>
<td>Non-active commissioning of equipment</td>
</tr>
<tr>
<td>1999 – 2011</td>
<td>Removal of reactor core and pressure vessel in 10 campaigns</td>
</tr>
</tbody>
</table>
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
**BLUE COLLAR FLUX PER SUIT TYPE**

<table>
<thead>
<tr>
<th>Type of suit</th>
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<tbody>
<tr>
<td>Ventilated suit – TV</td>
</tr>
<tr>
<td>Civil suit – TC</td>
</tr>
<tr>
<td>Basic suit – TU</td>
</tr>
<tr>
<td>Basic suit – TU_Dem</td>
</tr>
<tr>
<td>Active suit – TA</td>
</tr>
<tr>
<td>Active suit – TA_Dem</td>
</tr>
<tr>
<td>Active suit – TA_Inv</td>
</tr>
</tbody>
</table>

- Blue line: Team TA
- Red line: Team TA_Dem
- Green line: Team TA_Inv
- Purple line: Team TC
- Brown line: Team TV
- Orange line: TU_Dem

Years: 19-35

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*Sellafield Ltd*
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

Lot 2

Lot 3
## BENEFIT DELIVERY IS AT OUR CORE

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

- Forging partnership
- Familiarisation of Sellafield
- Common vision, mission and values developed
- Safety, security and in-flight projects
- Identification of scope and priorities
- Mobilisation plans agreed
- Future pipeline priorities agreed
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?