Sellafield Ltd Dounreay

GAMECHANGERS
DELIVERING NUCLEAR INNOVATION

# CHALLENGE: Post Operational Clean Out

Sellafield Ltd and Dounreay Site Restoration Limited (DSRL) are looking for innovative technologies to support Post Operational Clean Out, a phase in a plant's lifecycle where radiological and chemotoxic hazards are reduced which makes decommissioning safer, faster and cheaper.

Techniques to inform POCO operations to enable the reclassification of waste, approaches to effectively remove hazardous material from cells or process equipment and methods to enable the deployment of tools in hard to access areas are desired.

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## Introduction

POCO (Post Operational Clean Out) is a phase in a plant's lifecycle after operations have been completed where the radiological and chemotoxic hazards in the facility are reduced to a level which will enable the plant to undergo surveillance and maintenance and make the decommissioning process safer, faster, and cheaper. During POCO, the plant is characterised to document the type and location of hazards which are then reduced by removing process materials which may be in the form of deposits, contaminated solvents, active aqueous liquors, solids, sludges, and cruds. This is a process which ideally is carried out straight after a plant completes its final operations by the people who have operated the plant. It allows the existing infrastructure to be used such as the connected effluent and waste plants which, at a later date, may not be available.

It is estimated that the cost benefit of POCO could be a saving of £1.8bn across the life span of three key reprocessing facilities at Sellafield. A minimum of 87 facilities are due to undergo POCO over the next 40 years at Sellafield, with additional activities at Dounreay.

## Current Practice

Current POCO practice is focused on carefully sequenced washout of the plants using chemicals native to the process e.g. nitric acid, and by employing existing process equipment and techniques. Successful POCO requires the mobilisation of materials which:

- Are highly radioactive and chemotoxic;
- May be solid or liquid and acidic or organic in nature;
- Have become adhered or attached to vessel walls, process equipment and pipes;
- Have become engrained within metal;

## Challenge Aims

Sellafield Ltd and Dounreay Site Restoration Limited (DSRL) are looking for innovative technologies which would enable a step change in future costs such as ongoing maintenance and decommissioning. This can be achieved by techniques that provide real time data to inform POCO operations, enable the reclassification of waste, or provide an order of magnitude reduction in dose rate. Alternative approaches to effectively remove hazardous material from within the cell or process equipment and methods to enable the deployment of tools in hard to access areas are desired.

Sellafield Ltd and DSRL would like to explore:

- Access, deployment, and navigation techniques to remotely deploy tools for characterisation and decontamination.
- In-situ chemical and physical characterisation.
- Collection, interpretation and modelling of real time data.
- The use of chemical and physical methods to mobilise contamination.
- Decontamination of concrete.
- In-situ storage and immobilisation applications.

## Constraints

### Access and deployment

Plants are made up of cells which house a particular stage of the process. Typical cells consist of vast amounts of pipework and routine access for characterisation is via a small port (150 mm). These cell ports can be opened and used to deploy tools into the cell via a wall which is 1m thick. Cells tend to have high dose rates or contamination levels and are congested with pipes and vessels and in many cases the area you want to access is several metres away from the port. Some cells with a lower dose rate can be accessed more easily.

Vessels can be accessed via instrument lines (15mm – 25mm) which may be up to 15m in length and have six or more bends. There is no visibility to the inside of vessels. In some areas, penetrations could be installed to enable access.

### Characterisation

Characterisation is needed to identify locations which require decontamination and to confirm the plant condition prior to handover to decommissioning. Sampling of tanks is also required to confirm the chemical, physical and radiological properties of materials prior to decontamination and transfer to the waste facilities. Currently for chemical analysis, samples are taken and transferred to a laboratory. In some areas radiological and physical properties, such as density can be determined via installed or routinely deployed equipment.

### Decontamination

The radiological hazard is usually present on the inside of pipes and vessels in the form of solids, residues or contamination engrained within the stainless-steel plant items. Decontamination is carried out most commonly using chemicals which are compatible with the waste routes (typically nitric acid or sodium hydroxide) or via high pressure water jetting.

Other materials within the cell which may require decontamination could be mild steel, lead and concrete.

### Waste transfer and treatment

During POCO the aim is to transfer all process materials to an effluent or waste plant for treatment. The presence of insoluble materials that have accumulated can make this challenging due to the potential for blockages and some material may need to be packaged in-situ.

## What next

If you have new ideas or innovations that could address this challenge, we invite you to apply via the Game Changers website https://www.gamechangers.technology/challenge

For background information please visit the Sellafield POCO area on the Game Changers website.

If you'd like more information about the funding available through the Game Changers programme please visit www.gamechangers.technology/content/GameChangersFunding

If you have any questions that are not answered by the challenge statement or funding FAQs on the Game Changers website, please contact stuart.brown@fis360.com

**The deadline for applications for this challenge is 1pm, Friday 18th February 2022.**

Sellafield Ltd

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