

Calder Hall Environmental Management Plan

Issue 16 – September 2023



Calder Hall Environmental Management Plan

Issue 16 – September 2023

Introduction

Calder Hall ceased generating electricity in March 2003, after 46 years of operation. In accordance with Government policy, work has now begun to systematically remove (or decommission) the plant and buildings associated with electricity generation at the site. Prior to commencing this work, Sellafield Ltd, the licensee of the site, were legally required to seek consent from the Health and Safety Executive (HSE) to carry out the decommissioning project.

Application was made to the HSE (now Office For Nuclear Regulation (ONR)) for consent to carry out the decommissioning project at Calder Hall in August 2004. In support of this application, an Environmental Statement was provided, which assessed the impacts of the project on the environment. Following extensive public consultation, the HSE granted consent to carry out the decommissioning project at Calder Hall in June 2005, subject to certain conditions.

Under the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended) (EIADR99) the ONR requires that the Licensee prepare an Environmental Management Plan (EMP) which shall:

- List the mitigation measures that are already identified in the Environmental Statement and evidence submitted [to the HSE] to verify information in the Environmental Statement.
- List the options to implement work activities where mitigation measures may be required but where selection of an option will only be possible in the future; and
- List the work activities where mitigation may be required but where assessment to identify mitigation measures will only be possible in the future.

It is a requirement of the conditions attached to the consent to describe the effectiveness of the mitigation measures over time and review annually or at a suitable frequency agreed with the Office for Nuclear Regulation (ONR). Up until June 2015 the EMP was reissued annually, however due to very little changing operationally at the facility in 2016 and 2017 it was agreed that it was not necessary to reissue an EMP for those years. The last review was issued in September 2022. This review considers any changes at Calder Hall since September 2022 and considers the planned work for the Financial Year 2023/24.

Decommissioning Objectives at Calder Hall

- i) Manage the existing hazard at the Calder Hall site.
- ii) Manage the progressive reduction in hazard potential on the Calder Hall site.
- iii) Continue defueling of the reactors in line with Magnox Operating Plan requirements.
- iv) Progress items on the critical path to Care and Maintenance.
- v) Minimise ongoing maintenance costs by “Backing Out” of plant and buildings by discontinuing usage and removing services
- vi) Remove other plant and buildings as resources permit.

Works Completed and in Progress up to Financial Year 2022/23

Current Status

The Calder Hall site currently comprises four reactors and associated facilities, including two turbine halls, sixteen heat exchangers, the control rod mortuary, and a series of other ancillary buildings. The majority of the facilities are redundant.

Turbine Hall A and a number of adjacent buildings are in an area of land that has been identified for redevelopment as part of the SIXEP Contingency Project (SCP). As such demolition and ground remediation is required in this area by 2023 to support this significant site priority. These works form the Calder Land Clearance Project (CLC).

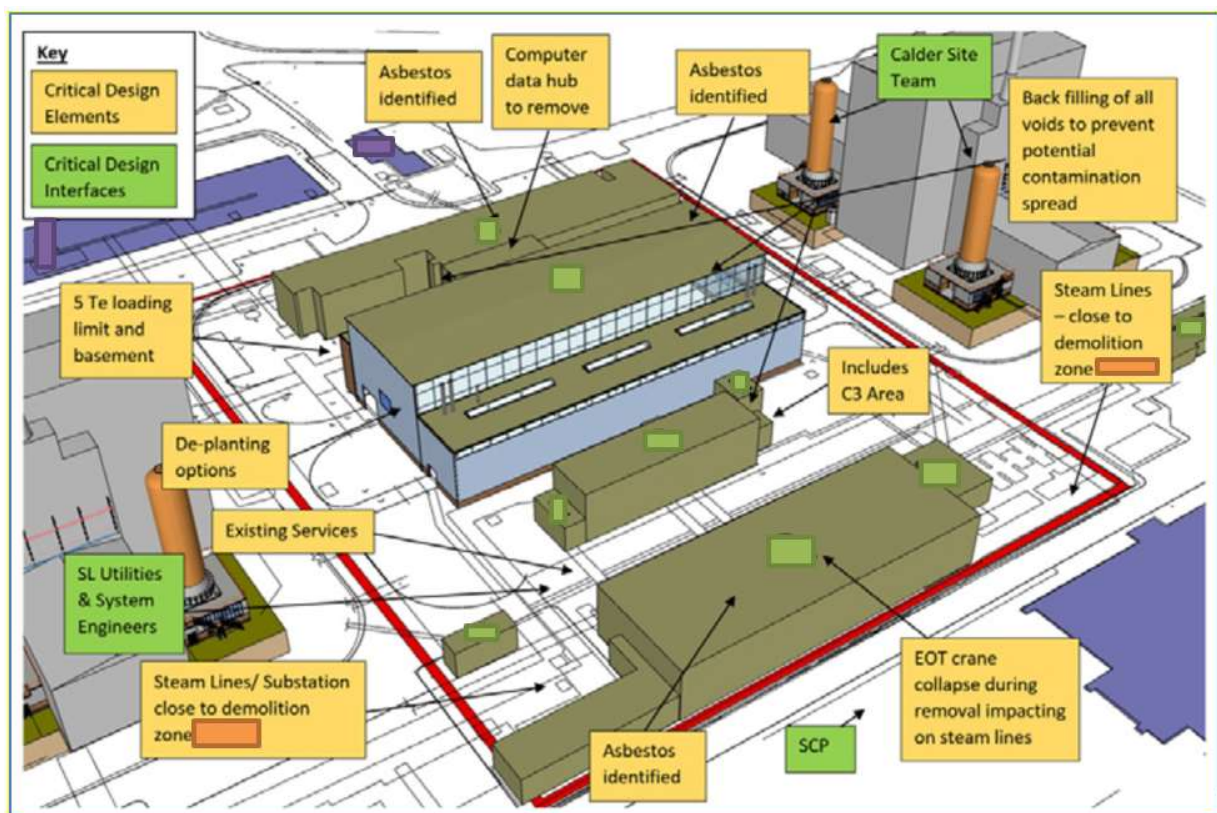


Figure 1: CLC Scope Image.

Miscellaneous Demolition

Calder Hall has now reached the end of its life and decommissioning has commenced. During 2023 the safe deconstruction to ground level base slab of the Control Rod Mechanism Workshop and Engineering Workshops were completed to meet C0 radiological classification.

All works on both buildings were completed by Plant Modification Proposal and were carried out in line with a Safe System of Work (SSoW) which comprised a detailed Risk Assessment and Method Statement. A quality plan detailing the rollback/declassification process was also produced ensuring each activity has been completed and approved prior to commencing with the next.

The Calder Land Clearance (CLC) project was initiated to clear an area within the Calder Estate which houses Turbine Hall A, redundant workshops and other ancillary buildings. This will allow the area to be redeveloped by the SIXEP Contingency Project (SCP).

To date the CLC project has cleared three workshops and ancillary buildings to the west of the site (see pictures below), with resultant waste being processed in line with approved waste management plans and removed from the site.

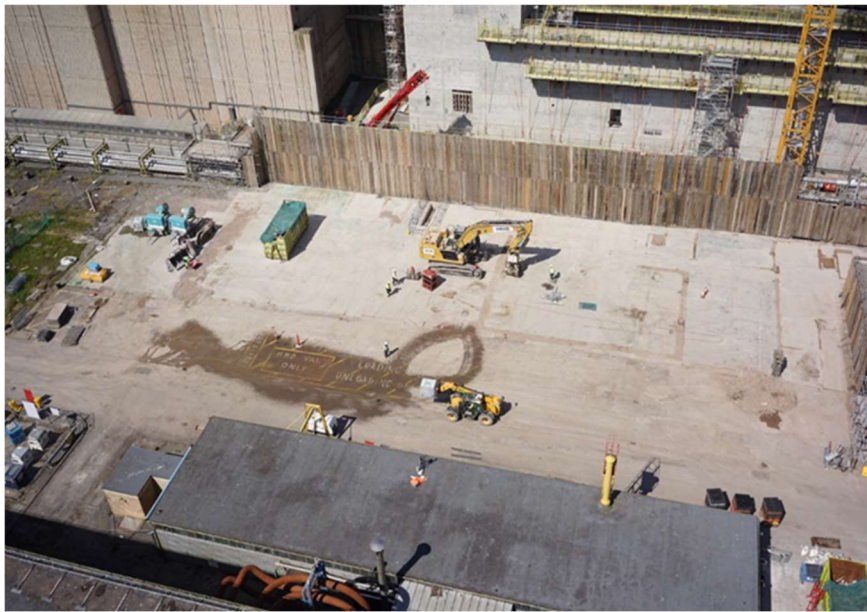


Figure 2: Redundant Engineering Workshops now demolished.



Figure 3: Demolition work completed on Redundant Engineering Workshops waste on base-slab awaiting disposal.



Figure 4: Redundant Control Rod Workshops prior to demolition.



Figure 5: Redundant Control Rod Workshop now demolished to base slab.

The next step for the project is to continue preparation of the old Administration Building including obtaining a licence from Natural England pertaining to a Bat maternity roost to complete the R&D surveys prior to demolition. In parallel work has commenced on the Environmental Clean within the Turbine Hall which will enable subsequent stages of de-plant and demolition.

As part of the CLC project, a Finding Of No Significant Effect (FONSE) form has been prepared (TN/CLC/PROJ/00002/P1). This can be provided upon request.

There is also a general deterioration of the aging facilities on the Calder Hall site, with some buildings such as the turbine halls being in a poor condition. Substantial asset care interventions will be required on buildings if they are not demolished promptly due to increased asset care and maintenance costs.

Asbestos Removal and Other Minor Decommissioning Activities

Over the last few years work has been ongoing to improve the conventional safety in the area through commencement of minor decommissioning activities such as asbestos removal, removal of high voltage electricity cables, service strip out, waste removal and building cladding enhancement.

During 2022/23, a significant amount of asbestos has been removed from the following areas.

Engineering Workshops (now demolished). Notifiable – Calorifier room & Electrical Service Trenches. Non Notifiable – Cement sheets, Gaskets and Fuse boards.

Control Rod Mechanism Workshop (now demolished). Notifiable – CO2 house pipe lagging. Non notifiable – Gaskets, rope in windows.

Tunnels between Turbine Hall A and former Calder Hall Administration Building. Notifiable – removal of asbestos from cabling, on floors and walls now 80% completed, (to be completed in 2023/24).

During 2023/24 pre clean of Turbine Hall A will commence.

Reactor 3 Pile Cap Annex – Notifiable – removal of Thermal Insulation.

Reactor 4 Pile Cap Annex – Notifiable – removal of Thermal Insulation.

Reactors 2,3 & 4 Long and Short Blower Houses - Notifiable – removal of Thermal Insulation.

Thermal waste removal locations – Notifiable.

Reactor 1 – Circuit 4 Bottom Elbow Area.

Reactor 2 – Circuit 6 Cyclone Filter House.

Reactor 3 - Circuit 2 Cyclone Filter House and Circuit 3 Cyclone Filter House.

Asbestos Cement Sheet removal – Non Notifiable.

Reactor 1 – Circuits 1,2,3 and 4 High Level Skirts.

Reactor 3 - Generator Exhaust Panel.

As part of Calder Land Clearance Project domestic water isolations and disconnections have been carried out during 2023/24 under Plant Modification Proposal (PMP).

Removal of redundant equipment

All four reactors were declared fuel free by August 2019, which is consistent with the MAGNOX Operating Plan. Since defueling was completed in August 2019, the redundant Reactor Pile Cap Fuel route equipment (including Discharge and Charge Machines) have all been removed and disposed of on Reactors 1, 2, 3 and 4.

Reactor 2 Pile Cap de-planting and decommissioning of the fuel route equipment has successfully been completed by Integrated Decommissioning Solutions (IDS) for Sellafield Ltd. This was the last Pile Cap to be de-planted across the Calder fleet of reactors, having successfully completed reactors 1, 3 and 4 previously. The scope of work delivered at each pile cap included the legacy contaminated fuel handling equipment such as the Charge Machines, Discharge Machines, Traverser Bogies, fuel chutes & stands. To aid the deplanting operations, the Electric Overhead Travelling Crane (EOTC) was utilised to safely lift the heavy components. The EOTCs at each pile cap are being maintained and kept in service by Sellafield however, the ongoing maintenance and life extension is budgetary burden. The removal of the pile cap equipment without the overhead cranes would have been significantly more difficult and costly and now that the items have been removed, this can help support the case for taking the overhead cranes out of service and thus reducing the maintenance liability for Sellafield.

Nearly 200 tonnes of metal waste has been safely disposed of during the clearance of the R2 pile cap. Learning from previous Pile Cap de-planting operations have aided the smooth waste disposal workflow during these operations. Examples of the plant items removed can be seen in Figure 5.

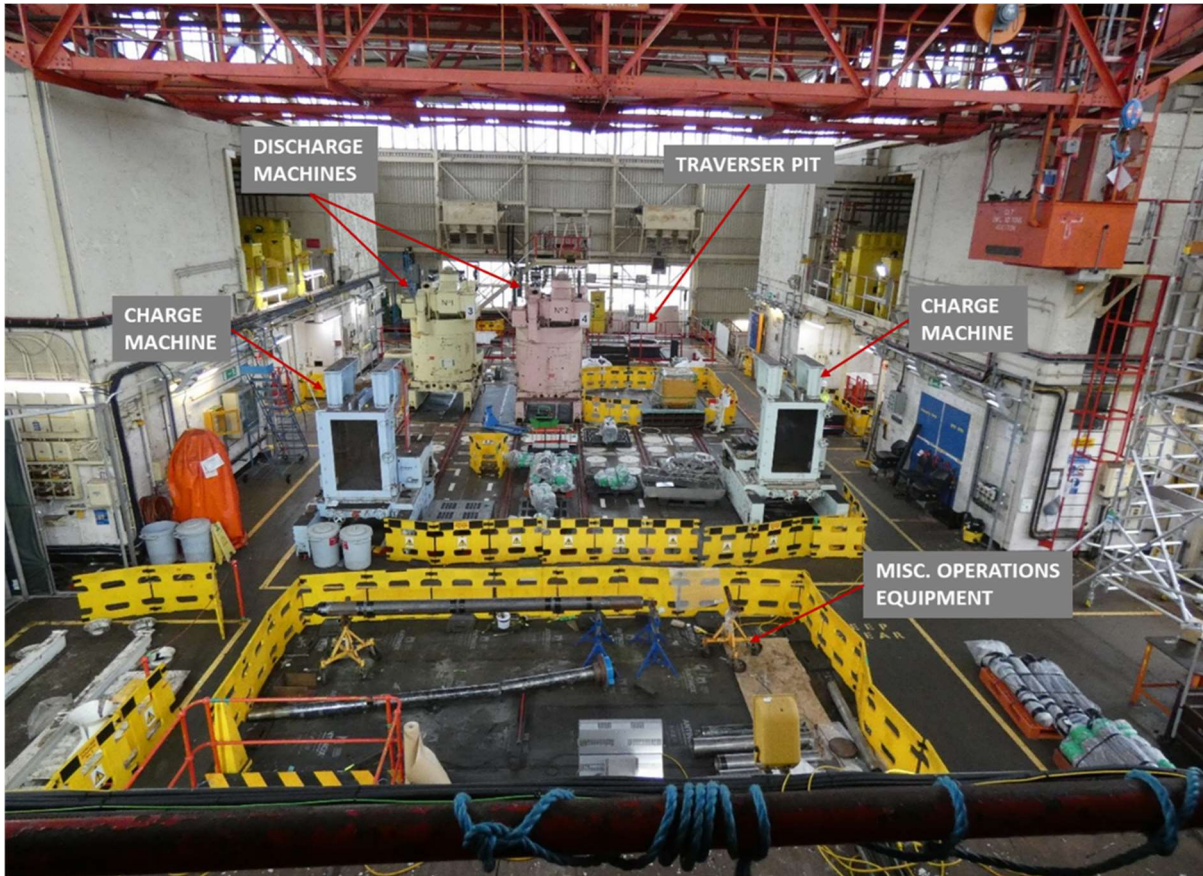


Figure 6: Before de-planting and removal of redundant Reactor Pile Cap Fuel route equipment.

The removal of the Charge machines, discharge machines and miscellaneous equipment has been aided by collaboratively working alongside Sellafield, this has allowed the Project Team to be delivery focused with Key Stakeholder engagement. The waste created during these operations has been processed and disposed of efficiently leaving no legacy waste of the Pile Cap equipment. Waste management during this project has been an additional success working alongside PCR, whom have been instrumental in waste collection for further size reduction of the shield rings from the Discharge Machines not to mention the removal of miscellaneous item. The relationship between the two parties bounds well for all future decommissioning tasks at Calder Hall.

Good collaboration and working between the IDS team, Sellafield and PCR (supply chain contractor supporting Sellafield's Waste Operating Unit) has been essential to the safe and efficient delivery of this work. Expertise and experience of the IDS team and the Sellafield resources (such as Health Physics, Waste and Construction) and also PCR has ensured the generation, removal and size-reduction of waste has been efficient and well-managed. Waste has been removed efficiently, without delay and need to store or leave behind around the work areas. This has benefited from experience and innovation led by the Sellafield Waste teams and PCRs, trialling various methods and techniques for dealing with the significant amounts of metals waste arising from these works. The end result, in terms of amount of waste removed, has supported a considerable proportion of the site-wide quota for generation and removal of metal waste in the past year. The de-planted pile can is shown in Figure 7 (overleaf).

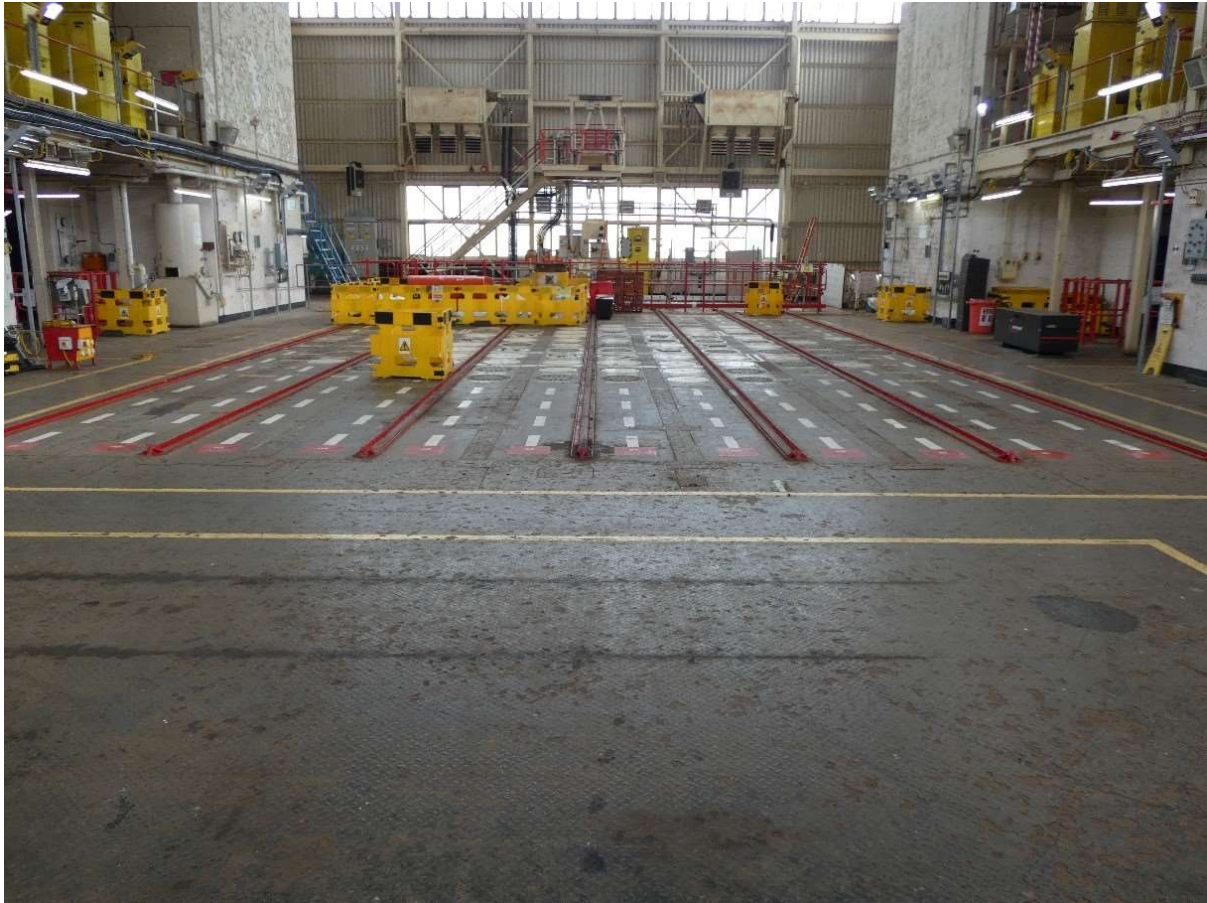


Figure 7: Reactor 2 Pile Cap after de-planting.

Additional Scope

The safe completion and the learning gathered from the Pile Cap deplanting works, has helped IDS identify further deplanting scope across all four reactor Pile Caps. This constitutes of various items of redundant electrical and HVAC equipment that can be removed and disposed of with the aid of the EOTC prior to it being taken out of service. This is another opportunity to reduce and retire risks and can provide another step in the mission of decommissioning the world's first commercial nuclear power plant

Most of the Reactor 1 compound (and Reactor 2 front area) have had their radiological categorisation downgraded to C1/R0 and the fenced areas around the compounds have been significantly reduced enable future Heat Exchanger de-planting tasks to be carried out.



Figure 8: Reactor Compound fence removal after radiological categorisation downgraded to C1/R0.

Removal of legacy effluent

The sampling, analysis & subsequent disposal of legacy IBC's of effluent in Turbine Hall B Compound continued throughout 2023/24 with the remaining 24 safely discharged or if non-aqueous, their contents were sent to the Chemical Disposal Hub during 2023/24.



Figure 9: Legacy IBC's of effluent pending disposal.

Use of Chemical Disposal Hub at Calder Hall

Disposals of legacy chemicals from across the enterprise continued being packed and disposed of from the chemical disposal hub during 2023/24.



Figure 10: The Chemical Disposal Hub at Calder.

Project related activities:

- SEAP (Site Emergency Assembly Point)

A building (Building 'X') at Calder Hall currently acts as the Site Emergency Assembly Point.

There is a legal requirement for Site Emergency Assembly Point (SEAP) provision (Nuclear Site Licence Condition (NSLC) 11). There are currently 3 Calder SEAPs. Building 'X' is due to be demolished as part of Calder Land Clearance (CLC) to provide land for SIXEP Waste Management (SWM).

As such, a site has been identified immediately South of the redundant laboratory building for a replacement facility. This area has been cleared of vegetation to allow construction activities to begin.



Figure 11: Land identified for location of new SEAP.

Calder Land Clearance (CLC) and Heat Exchanger Decommissioning

A Heat Exchanger removal Project has been initiated to look into the removal of the 6 Heat Exchangers that need to be lowered to ground to support the SiXEP Contingency Project (SCP).

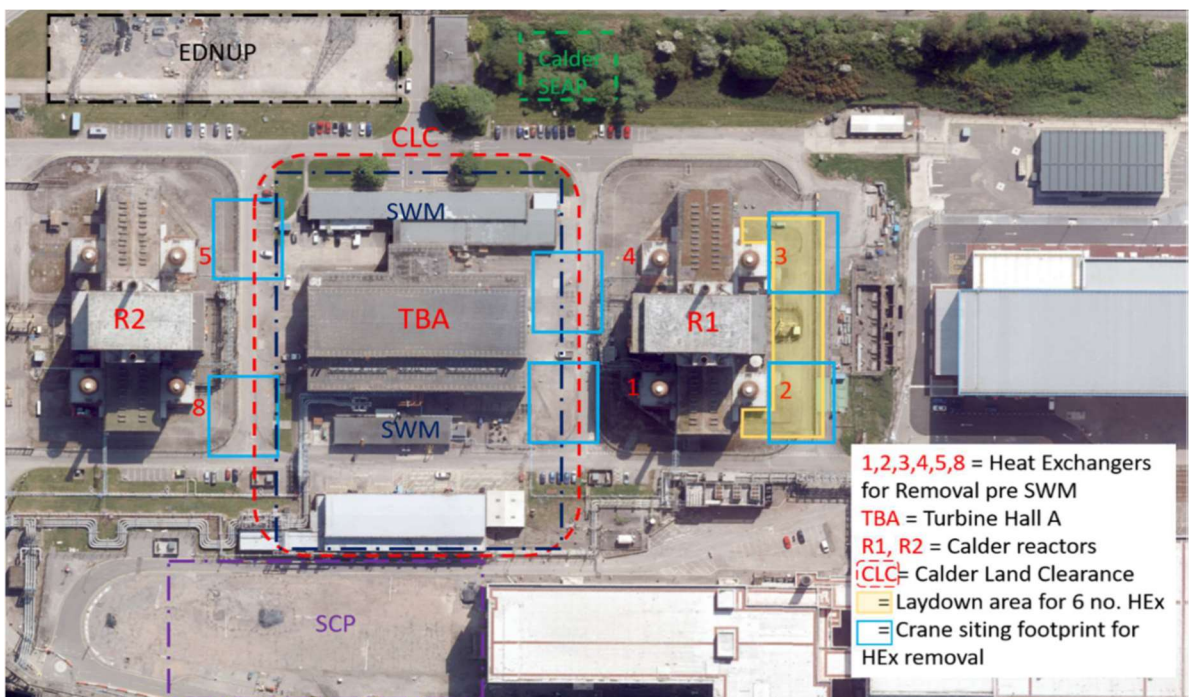


Figure 12: Location of CLC Demolition scope surrounding Turbine Hall A.

This project is split into several packages of work, including Reactor 1 elbows and bellows removal. Figure 13 provides an overview of the key sections that need to be removed.

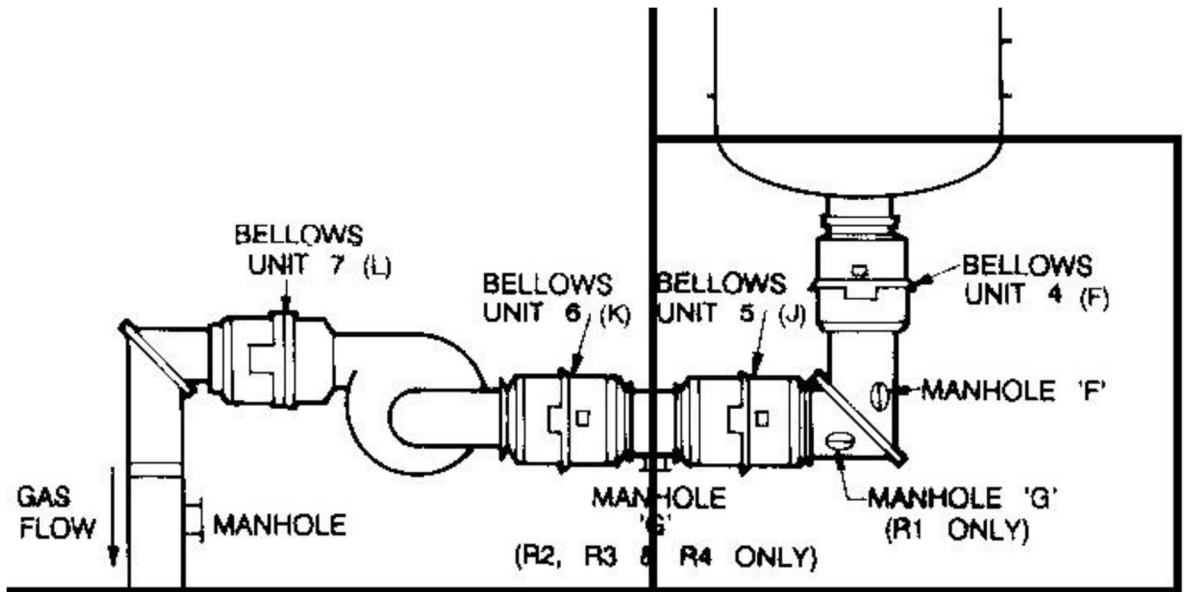


Figure 13: Image showing bellows/elbow section to be removed.

Figure 14 below shows how the Bottom Elbows and Bellows will be removed using rails.

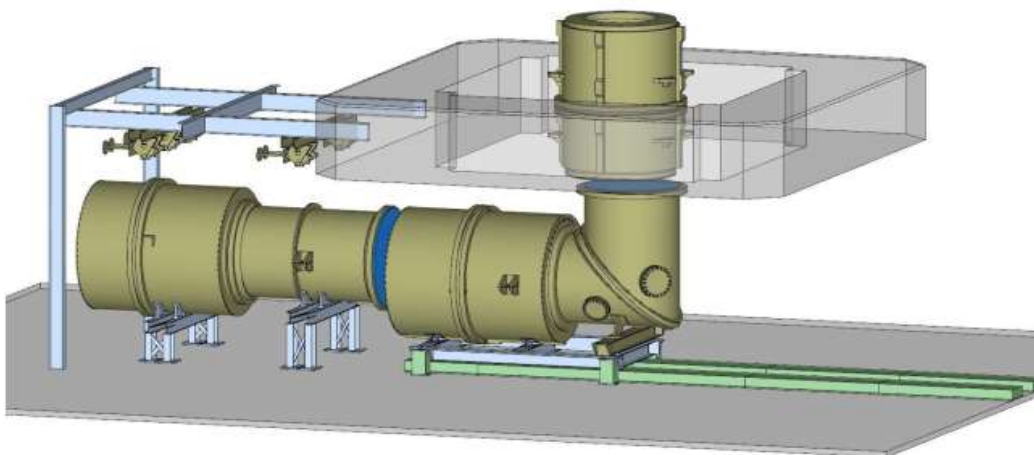


Figure 14: Image showing bellows/elbow section to be removed.

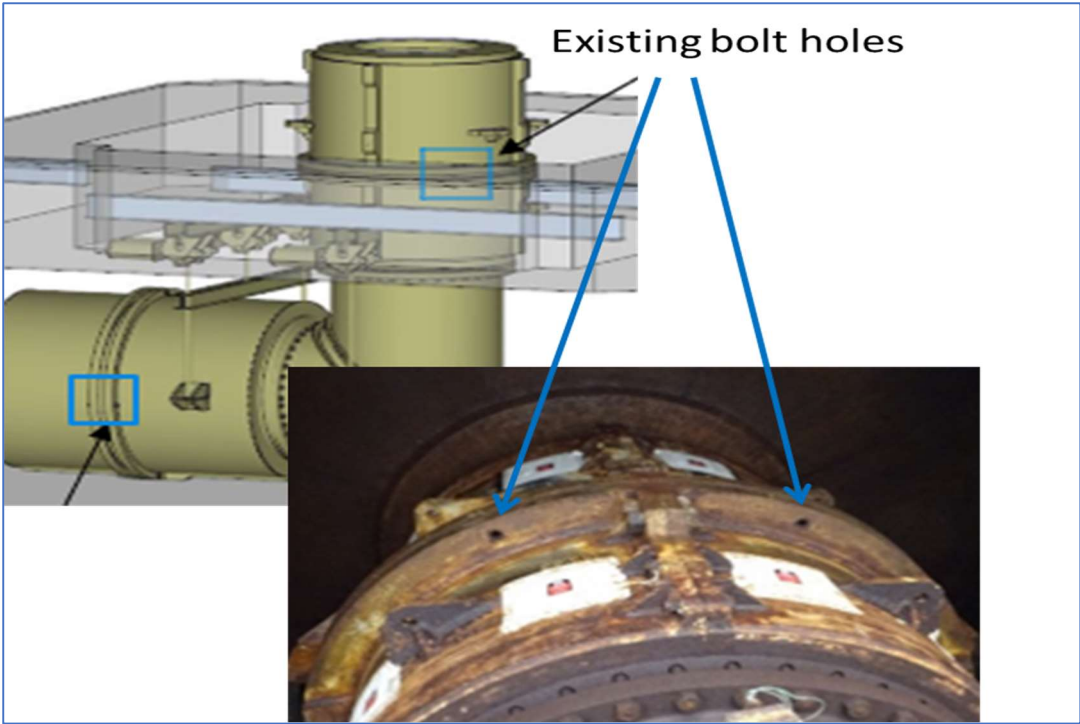


Figure 15: Image of section of elbows & bellows from Heat Exchanger

Work Completed and in Progress- Financial Year 2022/23 for HEX1 and HEX2

Non-Destructive Testing and Inspections of the Heat Exchanger carried out to underpin their current state and mitigate a key risk regarding lifting the Heat Exchanger as a single unit. Testing of the shear blocks, weld and thickness checks were carried out using a MEWP. The result of this work shows that the Heat Exchangers can be substantiated to be lifted as a single unit, assuming the Heat Exchangers do not degrade enough to change the substantiation.

Alongside this, Ground Penetrating Radar (GPR) Survey has been conducted in the area South of Reactor 1, in the area of the proposed laydown area for HEX1, to identify underground structures in preparation for trial pits which are due to be excavated early 2024.

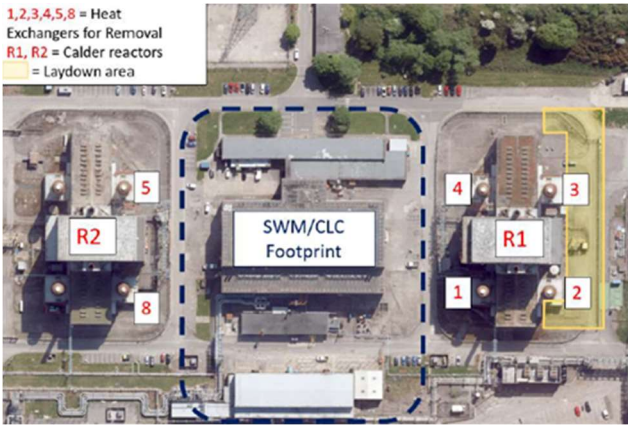


Diagram labelling scope of HEX1 (Heat Exchangers for removal) including proposed laydown area south of Reactor 1 (yellow area) where Trial pits to be excavated early 2024.

The trial pits, which will be located in the area South of Reactor 1, will determine land contaminants and makeup, to provide confidence to HEx1, that the ground is suitable to construct the proposed laydown area. This work is currently in planning and engagement with Subject Matter Experts is ongoing. As asbestos is known in the area, contaminated areas will be identified and treated. Asbestos soil sampling will be carried out for each trial pit location. The results of this sampling will determine a way forward and may require an Asbestos Licenced Contactor to clean up any asbestos contamination found.

As part of Heat Exchanger Characterisation, all thermocouples are due to be removed from Reactor 3 Circuit 1, late 2023. Thermocouples are targeted to be removed and analysed to provide up to date information on activity and subsequent dose, which will be used to understand the activity within the Heat Exchangers with a high level of confidence. Once the thermocouples are removed, swabs will be taken by entry from the voids left behind to provide a representative analysis from within the heat exchanger. These voids will then be sealed using blank flanges.

Information obtained by the analysis will support the decision-making process for the removal of Heat Exchangers for the HEx1 scope which is required for the HEx1 Preliminary Design Review Hold Point. The information will also identify disposal routes and options.

In 2024, an assessment of the Pumphouse condition is due to be carried out.

In 2024, design and planning will also initiate for Asbestos Contaminated Material (ACM) coring, the physical works associated with this will commence in 2025.



Figure 16: Work on the Reactor 1 heat exchangers.

Impact on EIADR

The progress described above is not considered to be a change or extension to the decommissioning project, therefore Regulation 13 of EIADR does not apply, and a Finding of No Significant Effect (FONSE) form is not required.

Works Planned for Financial Year 2023/24

Minor Tasks and Asset Management:

Calder Primary Circuit GEN Spring Removal (Reactor 4 Complete).

Reactor Blower House Encapsulations (All 8 Blower Houses).

Calder Windowpane Refurbishment (All Reactors).

Reactor 3 Degraded Pumphouses Concrete Roof & Brick Walls.

Reactor 4 Degraded Pumphouses Concrete Roof & Brick Walls.

Calder Roof Repairs.

Reactor 4 Calder Pipe bridge Removal.

All Reactors - Fire Detection system Improvements, Starting with Reactor 1.

Calder Deplanting Operations:

Asbestos removal works – Heat exchanger 1 - Elbows and Bellows currently prioritised then continue with Asbestos Management Schedule. 2 Licenced Jobs and increase in Asbestos Specialist resources obtained.

Relocation of 4 A1M Flasks – Integrated Decommissioning Solutions.

Turbine Hall B Pipe Bridge removal – Integrated Decommissioning Solutions.

Reactor 1 Verticals – Removal – Integrated Decommissioning Solutions.

Heat exchanger 1 – Elbows and Bellows removal Circuits 1,2,3,4,5,8 – Integrated Decommissioning Solutions.

General Soft strip & Size reduction and Waste Removal activities – Integrated Decommissioning Solutions.

Administration building adjacent to Turbine Hall B – R&D surveys, de-planting tasks etc (enabling task for Turbine Hall B demolition).

Beta Gamma Projects:

Calder Land Clearance – Demolition of Turbine Hall A and Main Administration Building.

SEAP – Site Emergency Assembly Point – New Build including Welfare facility and some office accommodation.

Heat exchanger 1 – Lifting preparation and ground preparation.

Heat exchanger 2- Thermocouple removal from Reactor 3 CCT1 heat exchangers for characterisation.

Turbine Hall B Project:

Demolition of former Water Treatment Plant effluent sump and back filling.

Strip out the redundant electrical equipment in Turbine Hall B.

Strip out of oil systems within Turbine Hall B.

Strip out of redundant services in the west side service trench within Turbine Hall B.

Removal of high level STW lines to the west of Turbine Hall B externally.

Asbestos R&D survey of the cable tunnels from Turbine Hall B to Reactor 3.

Categorised Projects:

Reactor Roof and Cladding replacement study.

2 for 20, Remediation Accelerated Decommissioning (RAD)

As part of the Sellafield Site Wide 2 for 20 Accelerated Decommissioning Programme it is planned that all eight redundant Blower Houses from all the Reactors will be demolished, and the land cleared by 31st March 2025. This will remove a significant conventional safety risk from the Calder Hall Site and will be ambitiously delivered within two years under the RAD Remediation Accelerated Decom scope. As part of 2 for 20 Program there is work also looking to accelerate Turbine Hall B demolition.



Figure 17: Reactor 3 with Long Blower House to the right.



Figure 18: Reactor 2 with Short Blower House to the left.

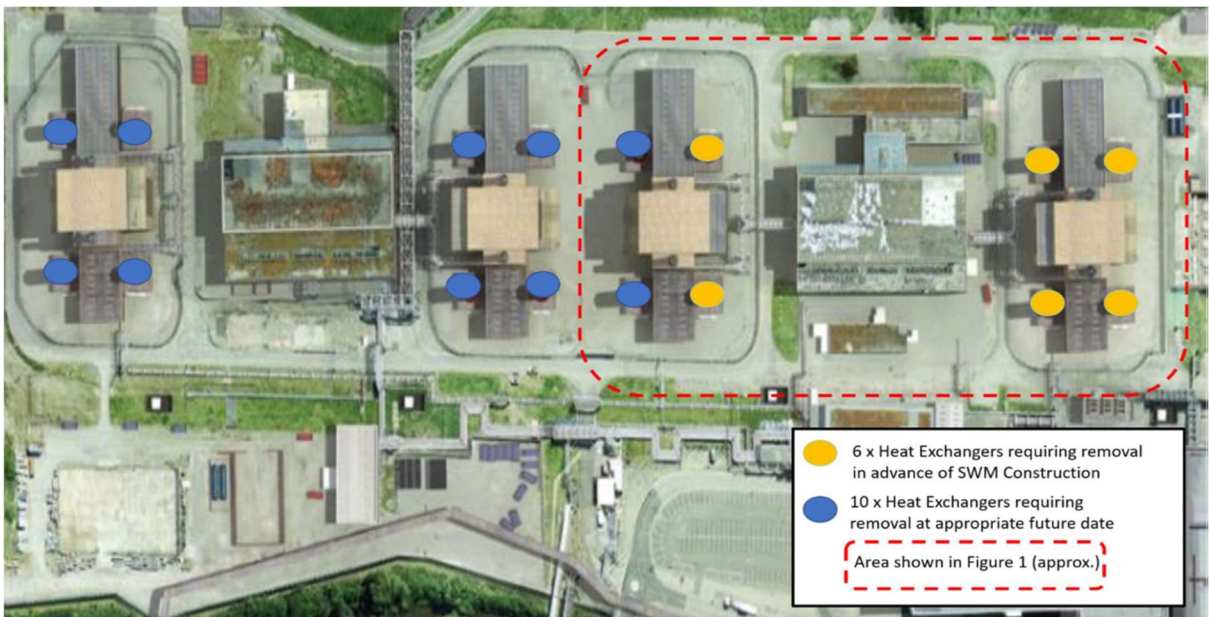


Figure 19: Calder Site overview presenting upcoming work and interactions. Please note, all areas approximate.

The land which currently contains Calder Hall Turbine Hall A and surrounding structures, is to be used as the footprint for the new SWM Facility with construction scheduled to commence in 2024. CLC project has therefore been initiated to demolish Turbine Hall A and its associated facilities. (Figure 19 on previous page).



Figure 20: Turbine Hall A.

Decommissioning of Reactor Buildings and related activities

Several items have been identified for removal from various parts of the four reactor buildings during 2023/24, including asbestos that was installed throughout.

During 2022/23 the removal of the remaining Reactor 2 redundant pile cap fuel route equipment, including discharge and charge machines was completed and disposed of during 2022/23.

Repairs are required on the reactor building glazing, including spray coating being implemented on the high-level glazing.



Figure 21: Reactors 2 and 3.

Impact on EIADR

From the scope of work described above it is not expected that any of the work will have a significant adverse effect on the environment, and therefore does not require further assessment under EIADR.

Environmental Performance and Mitigation Measures

It is a requirement of the conditions attached to the consent that this EMP reports on the effectiveness of the mitigation measures over time.

There are no significant changes to the mitigation measures that were submitted in the original Environmental Statement. However, there were continual improvements in traffic management due to changes in Sellafield Ltd.'s Transport Policy, up to the end of March 2020, when the Covid-19 Pandemic forced a change in strategy.

Prior to the Pandemic, employees and contractors were encouraged to share transport, (or use public transport) when travelling to or from the Sellafield Site. Shuttle bus routes and park and ride schemes were developed.

From the beginning of April 2020, these measures were suspended, and were under constant review up until April 2021, based on Government advice in response to the Covid-19 Pandemic. Since the end of the Pandemic Shuttle bus routes and park and ride schemes have been re-instated.

Assessment of mitigation measures has concluded there is no potential for decommissioning work at Calder Hall planned for 2023/24 to cause any significant environmental effects, based on the following criteria (used in Calder Hall's Environmental Statement, submitted under EIADR 1999):

- Air quality and dust.
- Archaeology and cultural heritage.
- Ecology.
- Geology, hydrogeology and soils.
- Landscape and visual.
- Noise and vibration.
- Surface waters.
- Traffic and transport.

Conclusion

There have been no significant changes to environmental performance since Issue 15 of the EMP was written in September 2022.

There have been no significant changes or extensions to the Decommissioning Project since the Environmental Statement was written in 2004, up to 2022/23.

Decommissioning work that is planned for Financial Year 2023/24 is not expected to have a significant adverse effect on the environment, and therefore does not require further assessment under EIADR. Any other changes or minor impacts will be captured in a FONSE.