

Calder Hall Environmental Management Plan

Issue 17 – September 2024



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1. 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 2023. This review considers any changes at Calder Hall since September 2023 and considers the planned work for the Financial Year 2024/25.

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.

2. Works Completed and in Progress during 2023/24

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 end of 2025 to support this significant site priority. These works form the Calder Land Clearance Project (CLC).

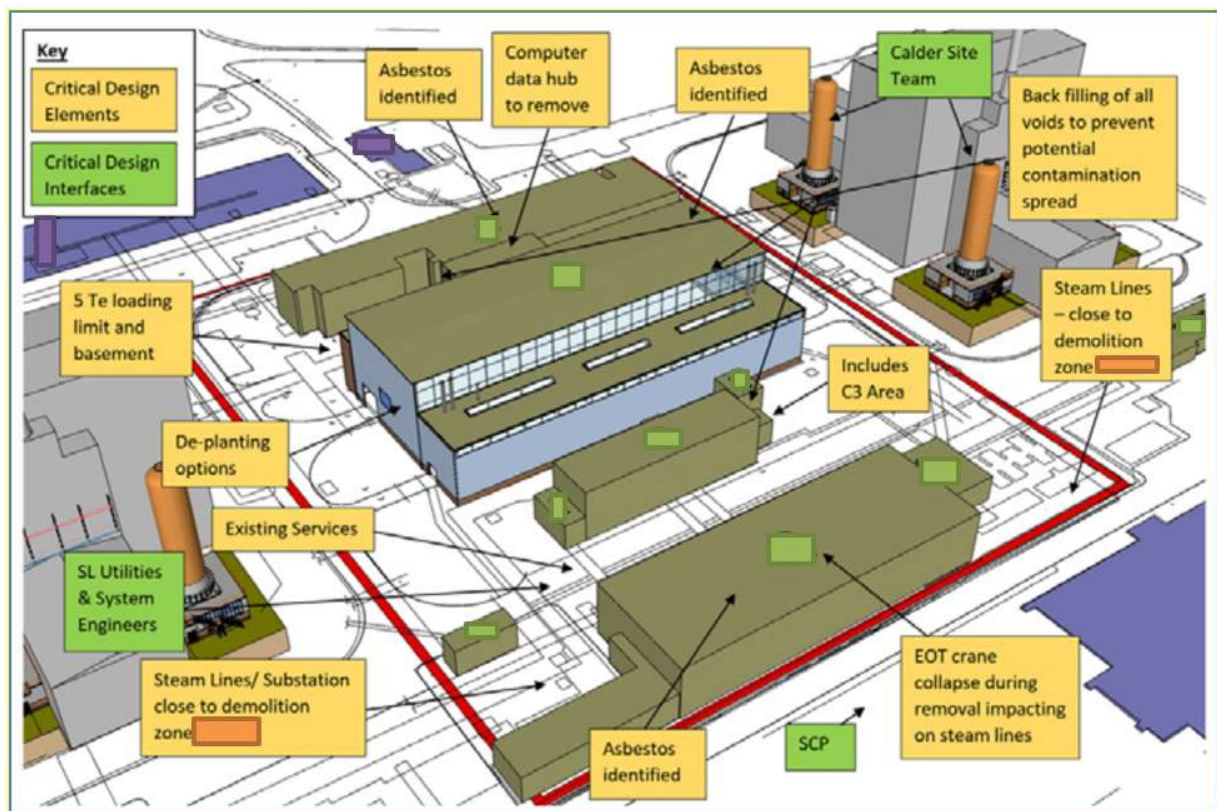


Figure 1: CLC Scope Image.

2.1. *Miscellaneous Demolition*

Calder Hall has now reached the end of its life and decommissioning has commenced. During early 2024 the safe demolition to ground level base slab of the main Administration Building was undertaken. The clearance of the Administrative Building required a licence from Natural England to re-site a Bat maternity roost identified by Habitat and Ecology Survey completed prior to demolition.

All works on the building was completed by Plant Modification Proposal and was 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 to ensure each activity was completed, status recorded and approved prior to commencing with the next.

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

Most recently in April 2024 the CLC project has cleared the main Administration Building and Changerooms, (see pictures below). Prior to this in 2023 the Redundant Engineering and Control Rod Workshops and other associated Ancillary buildings were demolished. All resultant waste has been processed in line with approved waste management plans and removed from the site.

All that remains now are four skips containing roof metal waste that require further characterisation prior to consignment. This has now concluded allowing this material to be routed off site in the near future.



Figure 2: Redundant Administration Building now demolished.

In parallel work has commenced on the Environmental Clean within the Turbine Hall which will enable subsequent stages of de-plant and demolition. The main focus of the work for the remainder of 2024/25 is asbestos containing material removal within Turbine Hall A, with 6 out of the 20 areas (enclosures) receiving their level 4 clearance certificates to date. In parallel to this, design work is ongoing to assess and refurbish the Electrical Overhead Travelling Crane

(EOTC) within the turbine hall which will be utilised to de-plant the turbines and larger plant items.



Figure 3: Turbine Hall A with in the foreground the site of the Redundant Administration Building now demolished.

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.

2.2. 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.

Asbestos Removal

During 2023/24, a significant amount of asbestos has been removed from the Calder Site. The CLC Project alone has removed 21 tonnes and overall at Calder during 2023/24, 89 tonnes has been removed from the following areas:-

Tunnels between Turbine Hall A and former Calder Hall Administration Building. Notifiable – removal of asbestos from cabling, on floors and walls now completed.

During 2023/24 pre clean of Turbine Hall A commenced. Followed by asbestos containing materials removal within Turbine Hall A, with 6 out of the 20 areas (enclosures) receiving their Level 4 Clearance Certificates to date.

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

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

Thermal waste removal locations (Notifiable) from the following areas:-

Reactor 1 – All Bellows and all Bottom Elbow Areas.

Reactor 2 – Circuits 5 & 6 Bellows and Bottoms Elbow Areas and 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.

Other Minor Decommissioning Activities

In parallel to asbestos removal design work is ongoing to assess and refurbish the Electrical Overhead Travelling Crane (EOTC) within Turbine Hall A which will be used to de-plant the turbines and larger plant items. As part of Calder Land Clearance Project domestic water isolations and disconnections have been carried out during 2023/24 under Plant Modification Proposal (PMP).

2.3. 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 all Reactors.

2.4. Reactor 1 & Reactor 4 Vertical Fuel Route Removal

In March 2024, the Project Team successfully completed all de-planting operations to disconnect and remove the redundant vertical fuel route equipment previously utilised within

the pile cap areas, discharge wells, reactor backstairs areas and discharge bays. Further work was then completed to dismantle and dispose of the Coffin Bogie, Bolting Station, Lid Lifter and Nitrogen Purge.

Following the success of the removal works in Reactor 1 IDS were awarded the same scope of work within Reactor 4. Site works began March 2024 and completed August 2024. The IDS team had operatives with considerable experience of working within the reactor buildings.

2.5. Removal of Desiccant

The removal of the ILW contaminated desiccant is required from Humidrier systems prior to the demolition of the blower houses. The methodology for the removal of this inventory has been considered to ensure application of Best Available Technique (BAT) and As Low as Reasonably Practicable (ALARP). This ensures that environmental risks, handling requirements and therefore dose are all reduced where possible.

The methodology for removal will utilise a well tested HEPA filtered Nilifisk vacuum with a long wand extension that will be inserted through an access port located at the top of each vessel. The desiccant pellets will be transferred from the vacuum system directly into 200L drums to enable consignment to VEOLIA for incineration at their Ellesmere Port Incineration Facility. The use of a vacuum represents the application of BAT as it reduces the risk of spillage that would be introduced should a pressure driven emptying system be utilised. All environmental aspects and impacts associated with the removal of this desiccant are captured within the overarching Calder Tasks Environmental Management Plan (EMP) and Project Environmental Aspects and Risks Register (PEAR).

The Environmental Management Plan has also been reviewed against the Calder Hall Environmental Statement and SLP 1.10.39 to provide an indication of compliance requirements but also identification of where potential environmental risks may be mitigated to reduce environmental dose impact to ALARP to further demonstrate BAT.

The application of BAT will be reviewed throughout the project to ensure any changes are considered and appropriate mitigation measures captured within a Technical Note produced titled, Humidrier Desiccant Removal/Best Available Techniques Assessment, the EMP and PEAR.

At the time of writing, a total of fifteen drums have been filled with one vessel emptied and only residual debris remaining in the second vessel. Approximately 950kg of Desiccant has been safely retrieved by vacuuming from the Humidriers. There is expected that for removal of this residue a small amount of desiccant will remain that is unsuitable for retrieval, but options are being investigated.

2.6. Turbine Hall B Tasks

The works completed this year include.

- Removal of the west side external pipework from Turbine Hall B (ex Steam to Windscale lines). This has removed approximately 35T of metallic waste from the area. See Figures 4 &5 covering the removal.
- A significant amount of water from the demolished water treatment plant sump has been recovered sampled, sentenced and successfully discharged during 2024.
- A significant quantity of post operational wastes from Turbine Hall B have been removed and disposed allowing for deplanting activities to commence.



Figure 4: Turbine Hall B – West Duct Work prior to removal.

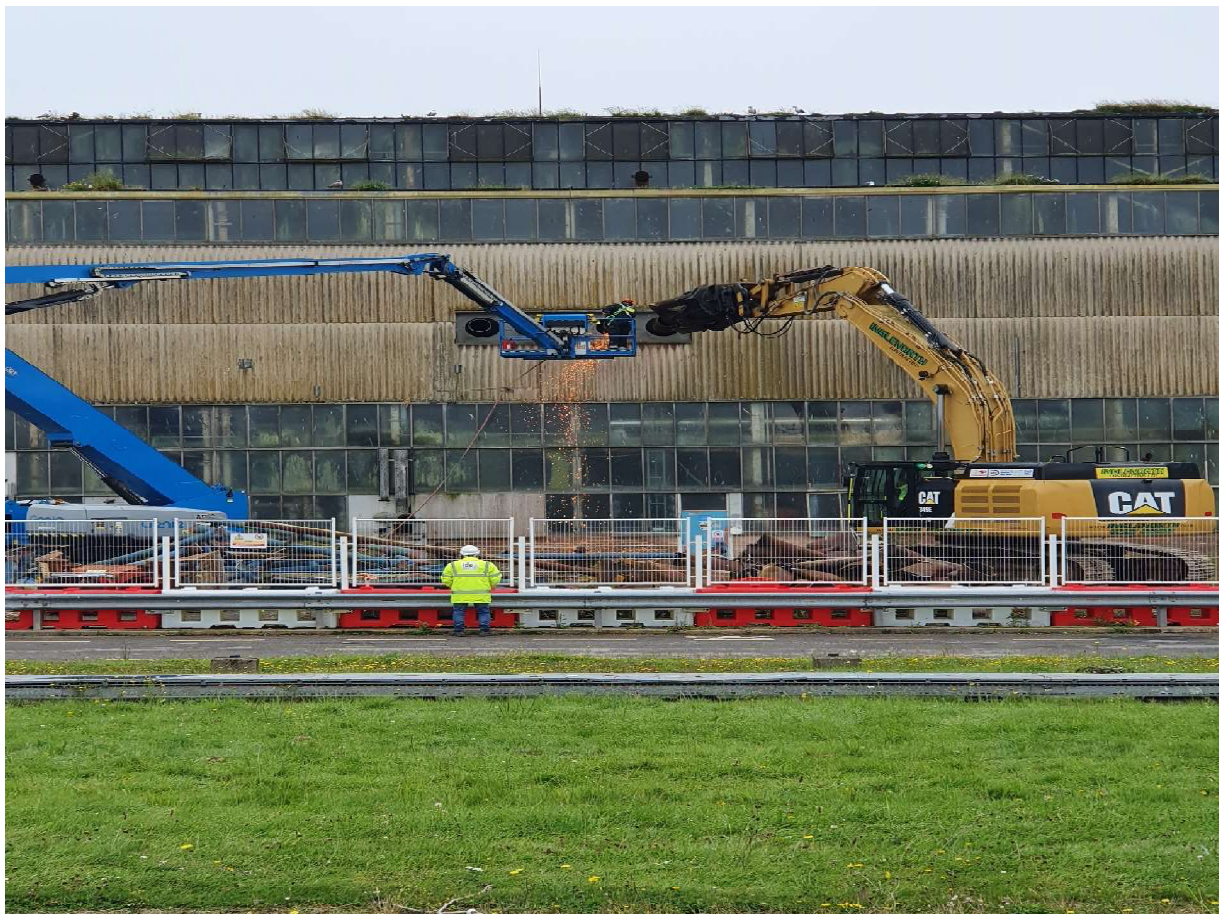


Figure 5: Turbine Hall B – West Duct Work during removal.

2.7. Turbine Hall B - West Duct Work Removal

As Turbine Hall B is in a significantly deteriorated state and all engineering assessments undertaken thus far indicate that the building has gone beyond a point where integrity could be returned it has been agreed that demolition is the most effective cause of action. The delivery strategy for Turbine Hall B remediation confirms that 'soft strip' and de-planting is best delivered in a package format, resulting in progressive risk reduction. The removal of external pipework to the west of Turbine Hall B formed a package within phase 1 for forementioned delivery strategy. IDS utilised a specialised demolition sub-contractor to remove approximately 320 linear feet of redundant Steam to Windscale pipelines (16" diameter 3/8" thick carbon steel), small-bore carbon steel, flash vessels which was completed during July & August of 2024.

Work planned for 2025/26.

- Complete post operational wastes and address conventional safety hazards throughout Turbine Hall B.
- Remove redundant electrical equipment from Turbine Hall B.
- Remove redundant oil systems for Turbine Hall B (bulk oils already removed).
- Deplant and demolition of Turbine Hall B.
- Commence strip out works within the redundant cable tunnels to the south east of Turbine Hall B.

2.8. Turbine Hall B – Reactor 3 Pipebridge Removal

Sellafield undertook an assessment of the pipe bridge in response to the Office for Nuclear Regulation's (ONR) concerns. Following this, IDS were engaged by SL to undertake the removal of the pipe bridge which spans from Turbine Hall B (THB) to Reactor 3. The extent of the removal includes the following:

- Section A- Across adjacent Street (and above active steam lines and water service).
- Section B1- Tower A to Tower B1.
- Section B2- Tower A to Tower B2.
- Section C1- Tower B1 to Long Blower house.
- Section C2- Tower B2 to Short Blower house.

For the remainder of 2024/25 the focus will be on dismantling and removal of the pipebridge connecting Reactor 3 to Turbine Hall B. This is a considerable piece of work as there is a requirement to protect site steam and water pipelines routed beneath.

2.9. Building adjacent to Turbine Hall B Waste & Hazard Removal

As part of the Turbine Hall B delivery strategy another scope of the work was to soft strip the interior of the adjacent building to remove hazards & waste. During the months of April & May IDS soft strip removed & disposed of damaged & loose cables, ceiling panels and waste materials.

2.10. Turbine Hall B – Ecology Survey

Sellafield instructed IDS carry out three bat and bird roosting surveys prior to progressing Turbine Hall B demolition. The first survey took place on 1st August 2024: bats were active in the area, but none visually seen emerging or returning to the building during the survey.

However, this is not conclusive evidence the ecologists have yet to analyse the sound files/data. Second & third surveys still need to be completed to confirm the initial findings.

3. Use of Chemical Disposal Hub at Calder Hall

The chemical hub is now in its fourth year of operation and disposals of legacy chemicals from across the enterprise continued being prepared, packed and disposed of from the chemical disposal hub during 2023/24.



Figure 6: The Chemical Disposal Hub at Calder.

4. New Project related activities:

4.1. SEAP (Site Emergency Assembly Point)

The main Administration Building at Calder Hall that previously acted as the Calder Facilities Site Emergency Assembly Point was demolished in April 2024 as part of Calder Land Clearance (CLC) to provide land for SIXEP Waste Management (SWM). As such, a site has been identified to the west of Reactor 4 / Turbine Hall B to site a new portacabin style SEAP, with office accommodation and welfare facilities.

There is a legal requirement for Site Emergency Assembly Point (SEAP) provision (Nuclear Site Licence Condition (NSLC) 11).

4.2. Calder Land Clearance (CLC) and Heat Exchanger Decommissioning

A Heat Exchanger removal Project has been ongoing for preparation of six of the Heat Exchangers for removal that need to be lifted and lowered to ground to support access for the SiXEP Contingency Project (SCP). This project is split into a number of stages:

- Asbestos strip.
- Bellows and Elbows removal.
- Heat exchanger group one removal, laydown and disposal (HEX1).
- Heat exchanger group two removal, laydown and disposal (Hex2).

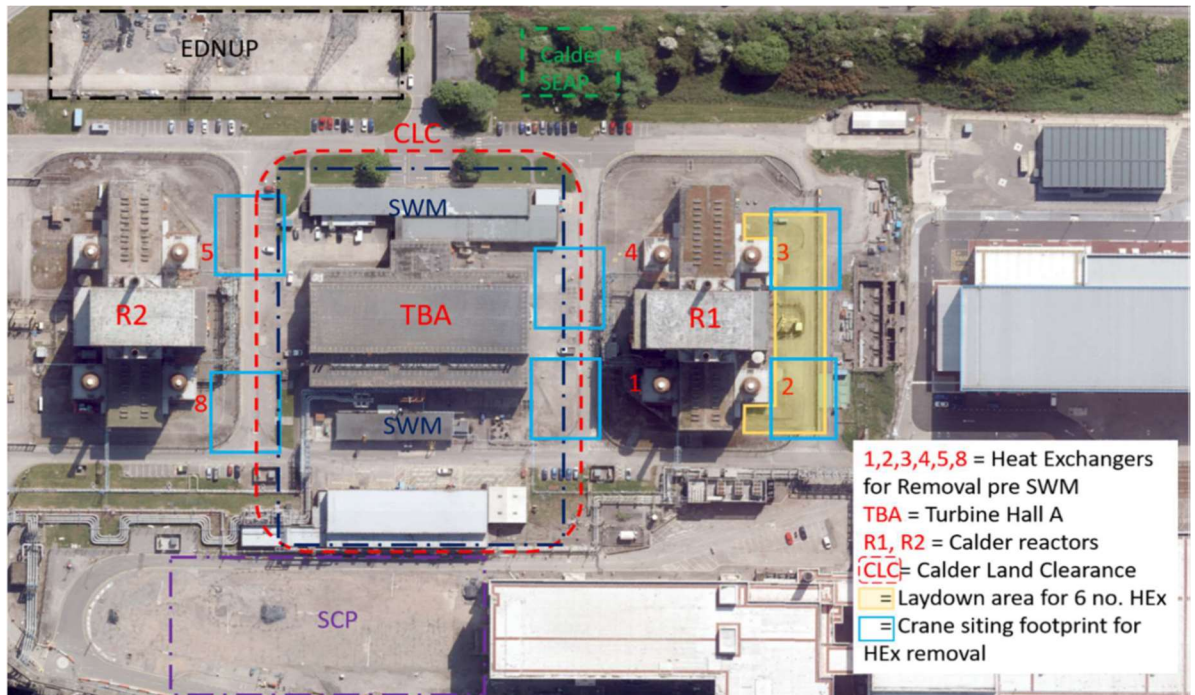


Figure 7: Location of CLC Demolition scope surrounding Turbine Hall A.

IDS have achieved a significant milestone within the Elbows & Bellows project. The scope is to include the separation and removal of the Bellows and Elbows from the Reactor Primary Circuit within each of the Pump Houses to Reactor 1 Circulators and Reactor 2 Circulators 5 & 8.

In March 2024 IDS successfully disconnected and removed the Bellows and Elbows from Reactor 1. The entire team have worked tirelessly from Design to implementation to reach this milestone. This was a result of the close working between all parties who upheld exemplary command and control throughout the work. This was achieved by all having a detailed understanding of the project, and clear communication being given at briefings.

Subsequently July 2024, IDS removed the Bellows and Elbows from Reactor Circuits 1 & 3, so all Elbows & Bellows are now removed from Reactor 1. Works will recommence in October 2024, following completion of the planned asbestos clean up, to remove the Elbows & Bellows within Reactor 2.

Figure 8 provides an overview of the key sections that have been removed during 2024.

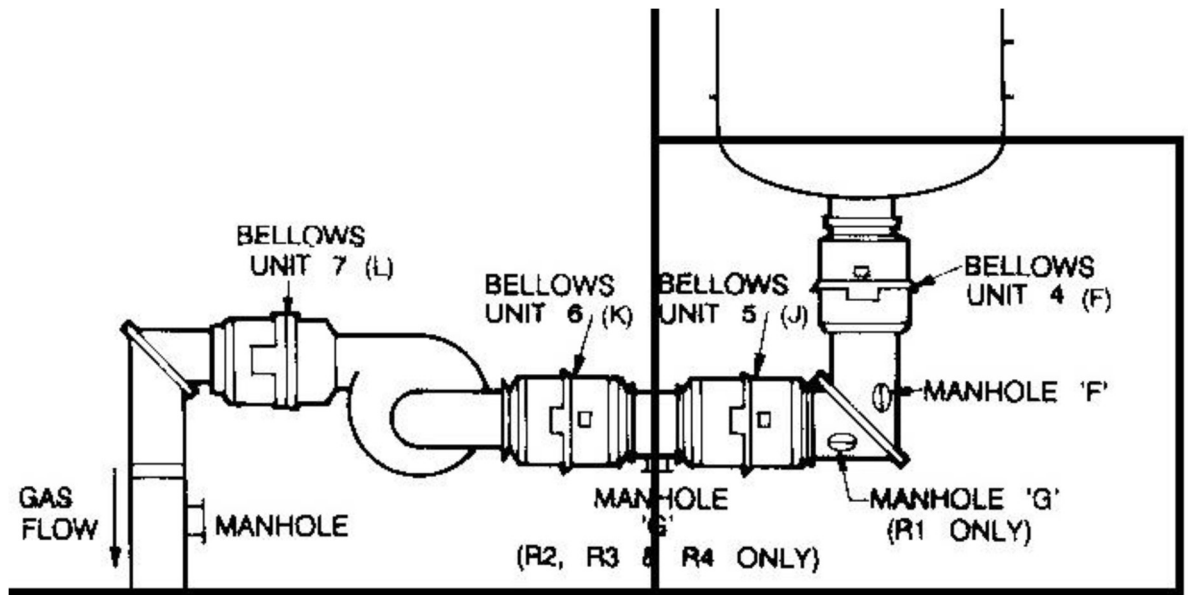


Figure 8: Image showing bellows/elbow section to be removed.

Figure 9 below shows how the Bottom Elbows and Bellows will be removed using rails.

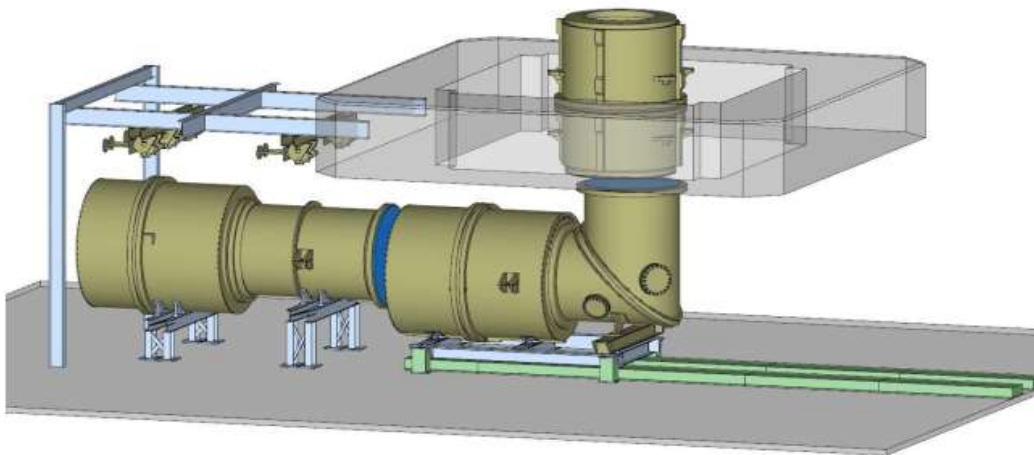


Figure 9: Image showing bellows/elbow section to be removed.

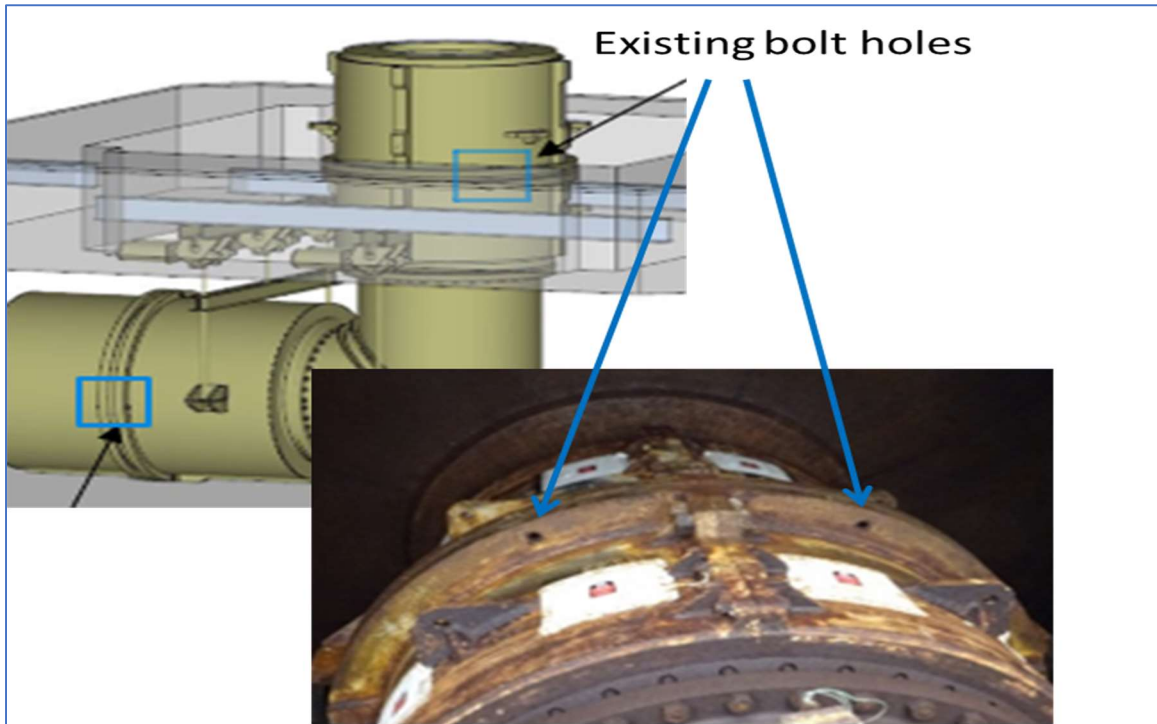


Figure 10: Image of section of elbows & bellows from Heat Exchanger.



Figure 11: Removed sections of elbows & bellows from reactor 1 Heat Exchangers awaiting disposal.



Figure 12: Removed sections of elbows & bellows from reactor 1 Heat Exchangers awaiting disposal.



Figure 13: Weatherproofed Base of Heat Exchanger after removal of elbows & bellows.

4.3. **Work Completed and in Progress- Financial Year 2023/24 for HEx1 and HEx2**

During 2023/24 HEx 1 no physical works have been undertaken, however.

- HEx 1 Overarching Business Case was approved In February 2024 via NDA GIC (Group Investment Committee).
- Works information and ITT (Invitation To Tender) question set has been produced by HEx 1 project team.
- ITT was issued June 24 following legal review, commencing the process to get supply chain onboard (DDP lot partner).
- Forecast tender have been returned.
- Trial pits to understand ground contamination/conditions around the HEx 1 laydown area have been commenced on Calder site in Sept 24.
- Boreholes RFQ was issued mid Aug 24 with siteworks forecast to commence on Calder site in Jan 25, this will help inform the HEx 1 laydown design.
- Potential for some asbestos surveys to be carried out in the pumphouses at the back end of FY24/25 but dependent on what the detail and timeline is in the contractor submission for this, see point above.
- Initial civil design of HEx 1 (bounding case) laydown area has commenced, completion is next FY as dependent on borehole information and delivery by successful DDP lot partner.

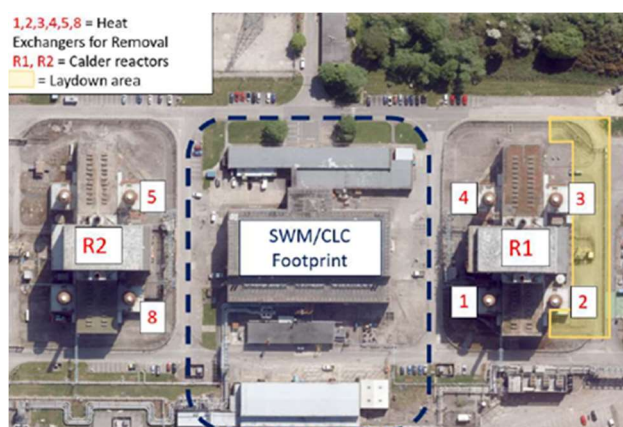


Figure 14: Diagram labelling scope of HEx1 (Heat Exchangers for removal) including proposed laydown area south of Reactor 1 (yellow area) where Trial pits were excavated in September 2024.

As part of Heat Exchanger Characterisation, all thermocouples were removed from Reactor 3 Heat Exchanger Circuit 1, during late 2023. Thermocouples were 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 were removed, swabs were taken by entry from the voids left behind to provide a representative analysis from within the heat exchanger. The voids have now been sealed using blank flanges.

Information obtained from analysis of the swabs 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 was carried out in preparation for asbestos removal.

Design and planning was also initiated for Asbestos Contaminated Material (ACM) coring, the physical works associated with this to commence in 2025.

5. 2023/24 Progress Impact on EIADR

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.

6. Works Planned for Financial Year 2024/25

6.1. 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 Reactor Roof Repairs.

Reactor 4 Pipe bridge Removal.

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

6.2. Calder Deplanting Operations:

Relocation of four A1M Flasks – Integrated Decommissioning Solutions.

Turbine Hall B to Reactor 3 Pipe Bridge removal – Integrated Decommissioning Solutions.

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

6.3. Beta Gamma Projects:

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.

6.4. Turbine Hall B Project:

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

Strip out of 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 alongside Turbine Hall B.

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

6.5. Categoriased Projects:

Reactor Roof and Cladding replacement study.

6.6. Remediation Accelerated Decommissioning (RAD)

The Remediation Accelerated Decommissioning (RAD) Project are looking to identify opportunities to accelerate decommissioning and have selected several facilities across the Sellafield Estate to trial novel approaches.

For Calder Hall, RAD are looking at preparation and demolition practices and subsequent waste management options for the Blower Houses associated with the Reactor facilities. Work has commenced on Reactor 4 Short Blower House with asbestos surveys and removal of redundant equipment and legacy wastes. The Blower houses have been fully characterised and characterisation reports have been produced. These reports have identified issues relating to presence of asbestos and that the desiccant content of the humidrier equipment (alumina catalyst) is of Intermediate Waste Level (i.e. greater than the 4 GBq/tonne Alpha & 12 GBq/tonne Beta/Gamma levels are exceeded).

The disposal of bulk spent desiccant successfully removed, reported earlier, using specialist vacuum equipment and transferred into metal drums is being led by Nuclear Waste Services.

The discovery of asbestos in various material populations has led to operational issues, particularly around packaging requirements for transport. Work is currently ongoing to resolve these issues and in the last week, further work has been undertaken to refine the characterisation outputs for some of these materials which may mean that the asbestos bearing materials may now fall out of ADR (Transport of Dangerous Goods by Road) Regulations. This will hopefully be confirmed in the coming weeks.

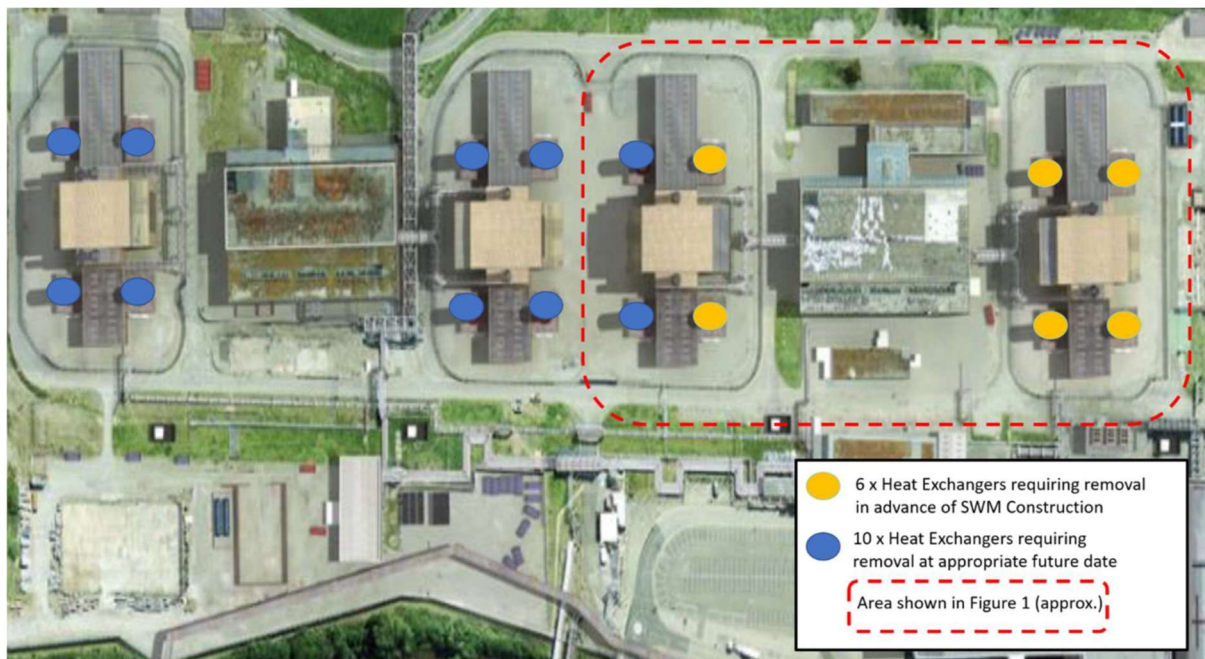


Figure 15: Calder Site overview presenting upcoming work and interactions. Please note, all areas approximate.

6.7. 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.

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

7. Environmental Performance and Mitigation Measures

It is a requirement of the conditions attached to the EIDAR 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.

The RAD Project have been looking for efficiencies and acceleration of projects/decommissioning scope. Reactor 1 Project has also been another example of adopting an integrated approach that has accelerated progress and removed unnecessary rework.

Assessment of mitigation measures has concluded there is no potential for decommissioning work at Calder Hall planned for 2023/24 and beyond 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.

8. Conclusions

There have been no significant changes or degradation to environmental performance since Issue 16 of the EMP was written in September 2023.

There have been no significant changes or extensions to the Decommissioning Project since the Environmental Statement was written in 2004, up to end of FY 2023/24.

Decommissioning work ongoing or planned for Financial Year 2024/25 is not expected to have a significant adverse effect on the environment, and therefore does not require further assessment under EIADR. Any other scope changes or any new/changed minor impacts will be reviewed and captured in a FONSE as appropriate.