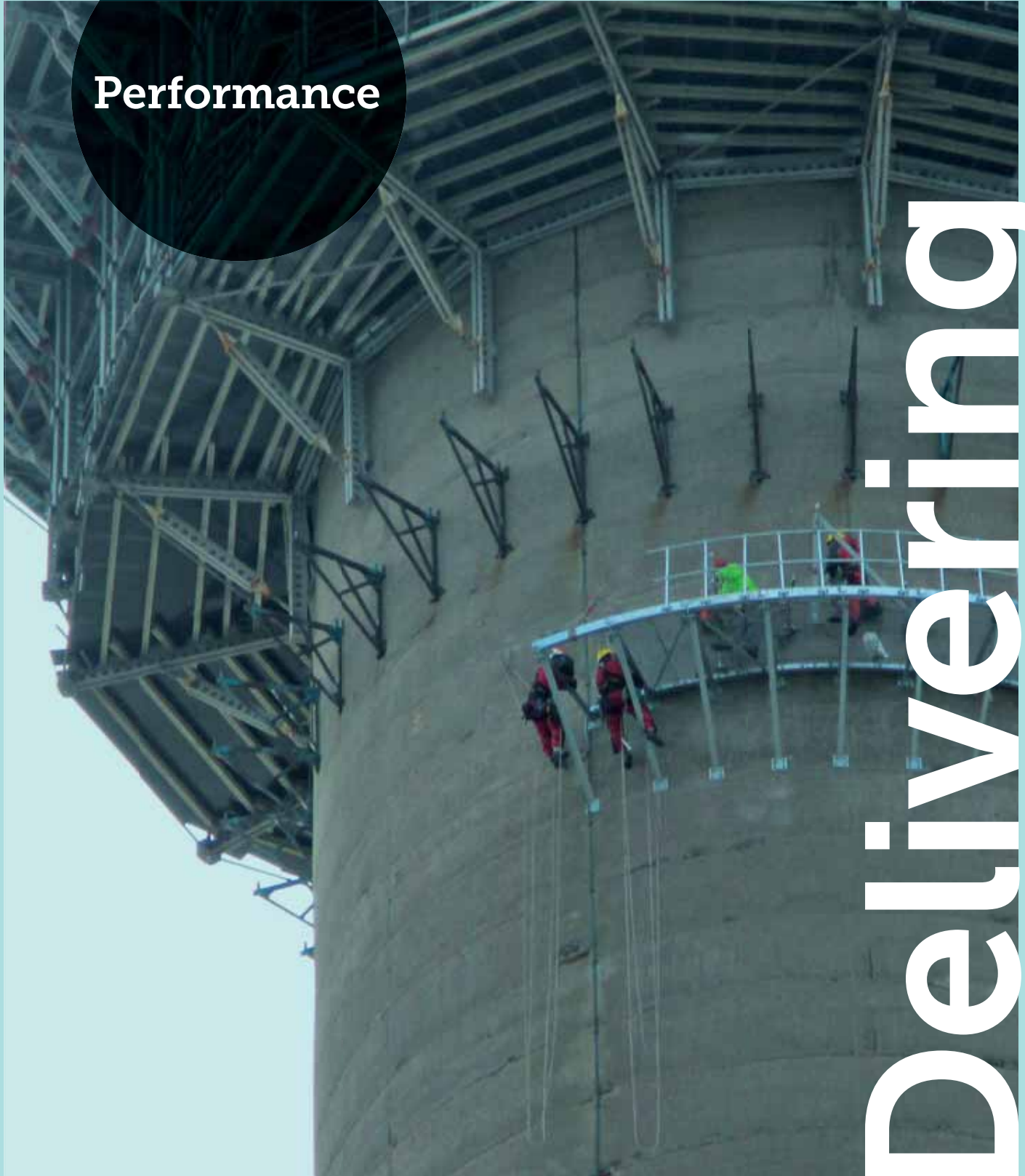


Performance



Delivering

# Contents

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# Making Sellafield safer sooner

*The Sellafield site in West Cumbria is one of the most complex and hazardous nuclear sites in the world.*

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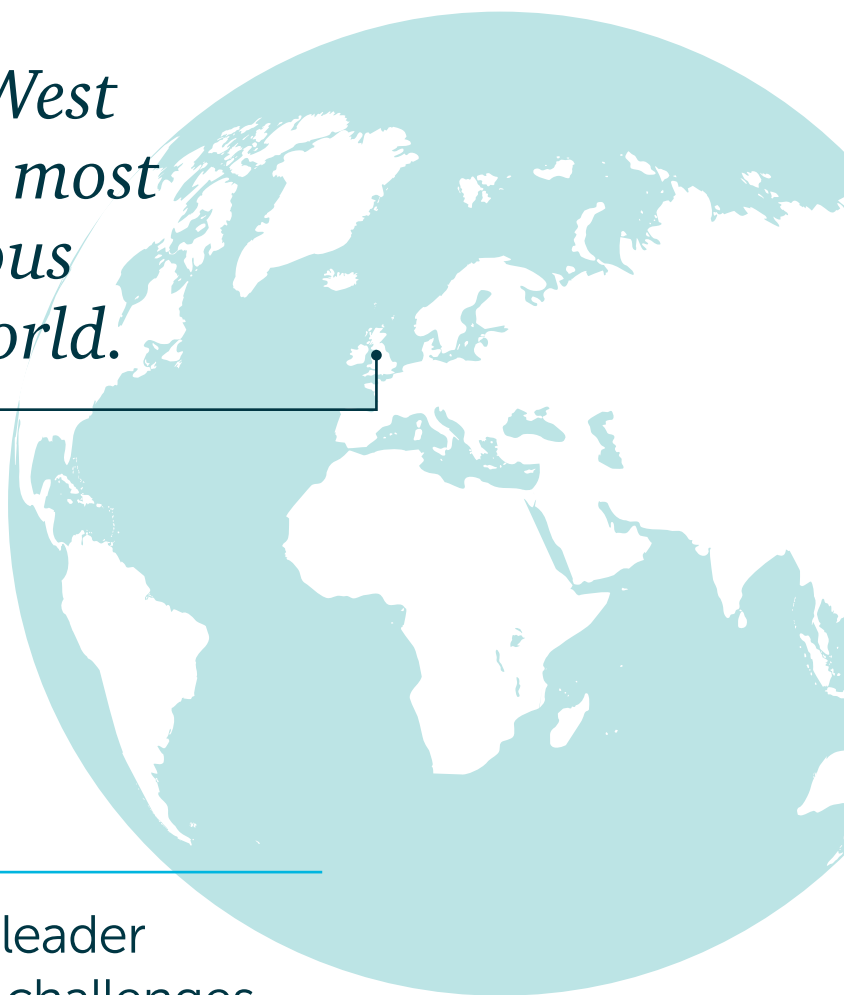
**Our purpose** is to clean up Sellafield.

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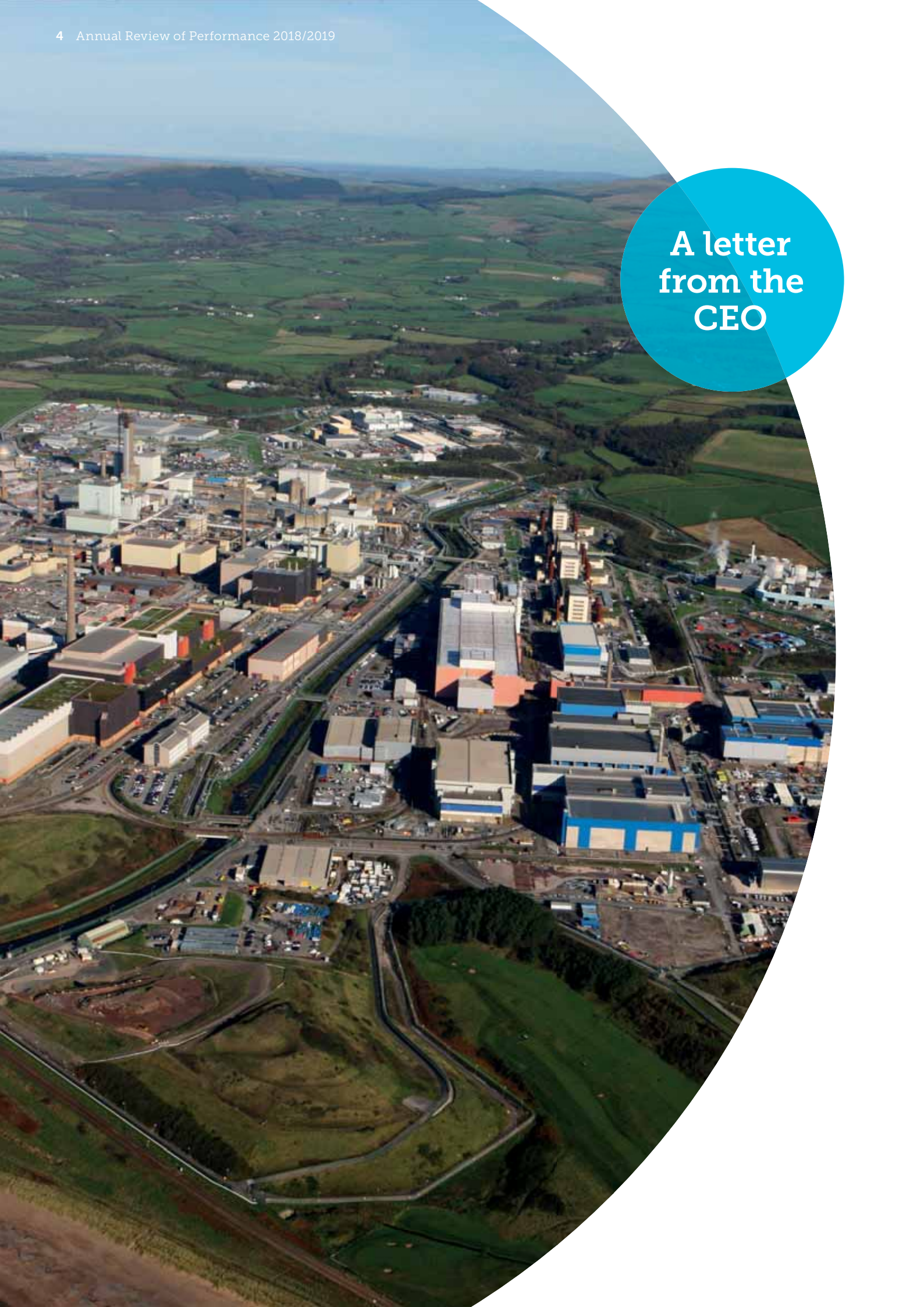
**Our vision** is to be a world leader in solving complex nuclear challenges.

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**Our mission** is to safely and securely remediate the Sellafield site for the benefit of the industry, nation and region.







**A letter  
from the  
CEO**

**The success of a £2 billion turnover company would ordinarily be judged by its share price, the amount of profit it had made or perhaps its market share.**

**At Sellafield Ltd we don't have any of those traditional measures. We don't pay shareholders dividends, we are a non-profit organisation and, as the nuclear site licence holder for Sellafield, we aren't in competition with other organisations to deliver the mission on the site.**

**Instead we measure our success by performance against our strategic objectives; safe, secure site stewardship, demonstrable progress, and delivering a return on the investment for our stakeholders. We also have a duty to make a positive societal impact in the areas in which we operate.**

### **Safe, secure site stewardship**

We continue to drive towards zero accidents and safety events at Sellafield, however we have described our performance in the past financial year as mixed. We saw strong performance in our nuclear and radiological safety, but we also saw a disappointing trend in conventional safety and environmental events.

At the very end of the financial year we entered a guilty plea to a prosecution by the Office for Nuclear Regulation over a personal contamination event that happened in February 2017. As I said at the time of the hearing, it is extremely disappointing that it happened despite our robust and thorough safety arrangements, and that it had an adverse effect on one of our employees and their family. This was an isolated incident and the Office for Nuclear Regulation acknowledged that the case does not point to any broader concern about the control of risks and hazards across our site. But it is a strong reminder of the nature of our business and to redouble our efforts to improve.

The Office for Nuclear Regulation also issued us with an Improvement Notice following damage to a high-voltage cable in May last year during excavation work. The incident did not result in any

injury but clearly had the potential to do so. As a result, we have reviewed our approach to excavation works and have implemented improvements.

Along with the safety of our employees, the security of our site, our nuclear facilities and nuclear materials is our overriding priority. In 2018/19 the site benefited from investment in visible and non-visible security measures that have contributed to our industry leading security performance.

### **Demonstrable progress**

I am proud of how much Sellafield is changing. Last year, some of milestones we achieved include:

- Completing reprocessing in Thorp and making progress to safely conclude Magnox Reprocessing.
- Getting our two legacy waste facilities ready for retrievals. That means that in 2019/20 we will be removing waste and sludge from all four of our legacy ponds and silos.
- Awarding a 20-year contract to bring in Project and Programme Partners to help us deliver mission-critical capital projects at Sellafield.
- Changing the Sellafield skyline, bringing a redundant ventilation stack to a height where it no longer poses a risk to the surrounding buildings, and

starting to demolish the diffuser at the top of the Windscale Pile Chimney.

This year, our challenge is to continue this progress, while working more efficiently, removing waste from our processes and procedures and focusing on those things that provide the most value.

### **Return on investment**

We set ourselves challenging role and cost reduction targets to help make us more efficient, to deliver more value.

These targets are not designed to remove people from the business or to hand money to shareholders. They are designed to move resources to more value-adding activities.

In 2018/19 we removed over 500 roles from the business, moving those people to new jobs in the business, and delivered over £300 million of savings.

### **Transforming**

Our success in 2018/19 should also be judged against our progress towards becoming the business that we want to be.

To this end we:

- Launched our new Values:
  - Safety and security: at the heart of all we do as we move to be an environment remediation company.





- Ambition: working collaboratively and considering how we can improve at every opportunity.
- Integrity: doing the right things and being open and honest.
- Inclusion: respecting and including the individual and creating an environment in which people grow, develop and perform at their best.
- Launched our new social impact strategy, setting out our ambition to help our communities create a diverse and sustainable future beyond the nuclear industry.
- Tackled issues identified in our Equality, Diversity and Inclusion survey, specifically mental health and bullying and harassment.
- Reconfirmed our commitment to the next generation through our apprenticeship and graduate schemes and through the introduction of a community apprenticeship programme.

**Making the most of the opportunities ahead**

The coming financial year is another vital step for us.

It will see us move closer to the end of reprocessing in Magnox, emptying Calder Hall’s reactors for the final time, and start to retrieve waste from our silos.

It will see us continue to drive for efficiencies, removing waste from the business, channelling effort to make Sellafield safer, sooner.

It will see us continue to work differently, more collaboratively, with the supply chain.

I know that such times of change can give rise to uncertainty, but what we do know is that our pursuit of efficiency is already paying dividends.

Our performance in 2018/19 has given our owner, the Nuclear Decommissioning Authority (NDA), confidence in our abilities. They have asked us to deliver £100 million of

additional work, including work in support of the wider NDA group and the further acceleration of retrievals from the legacy ponds and silos.

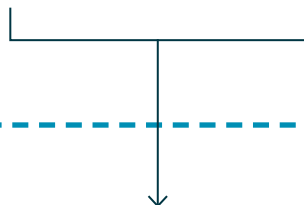
I believe we will deliver even more value in 2019/20, and I look forward to working with our employees, supply chain, stakeholders and communities as we do.

**Paul Foster,**  
Chief Executive Officer  
Sellafield Ltd

# Who are we?



Part of the Nuclear Decommissioning Authority group.



## Sellafield Ltd

Owned by the Nuclear Decommissioning Authority, we spend £2 billion every year but are a non-profit organisation. We are working with our supply chain partners, academia and research institutes to clean up Sellafield, one of the most complex environmental remediation challenges in the world.

### What are our values?

#### Safety and security

Safety and security are at the heart of all we do as we move to be an environmental remediation company.

#### Ambition

We work collaboratively and consider how we can improve at every opportunity.

#### Integrity

We do the right things and are open and honest.

#### Inclusion

We respect and include the individual and create an environment in which people grow, develop and perform at their best.



# What are we doing?



**We're carrying out the environmental clean-up of the most complex and hazardous nuclear site in the UK.**

The decommissioning of the Sellafield site will take over 100 years.

As reprocessing comes to an end, so our focus is shifting to high hazard retrievals, risk reduction, broader decommissioning activities and remediation.

We're working to clean up the site as quickly as possible but won't jeopardise our duty of care by working in haste.



**We recycle and store used nuclear fuel.**

As specialists in spent fuel management, Sellafield receives, treats, recycles, and packages all levels of nuclear waste.

Our new facilities will safely store nuclear fuel for EDF Energy.

We return any waste that arises from our overseas customers to the country of origin.





**We're guarding the UK's special nuclear materials.**

Sellafield was a pioneer in the development of the nuclear industry in the UK.

Now, as global experts in the safeguarding of special nuclear materials, our priority is the safe and secure stewardship of our country's stores of special nuclear materials.



**We're global experts in nuclear waste management.**

As our mission to clean up our legacy buildings progresses, we're building modern waste retrieval, processing and storage facilities to look after the resulting nuclear fuel and waste.



**We're delivering capital projects.**

Delivering our mission at Sellafield depends on our ability to successfully and consistently deliver major projects. We must do so safely, to specification (quality), on schedule and within budget.

*We are making Sellafield safer sooner*

# How are we doing it?



## **Delivering with speed, not haste**

At Sellafield Ltd we use, process, move, retrieve and store nuclear fuels, materials and sludge on a day-to-day basis. We treat these materials with respect and due care, for the safety of our employees, our community and our environment. We continue to seek and invest in ways to deliver our mission to clean up the Sellafield site as soon as possible – in ways that make the best use of taxpayers’ money. We look for efficiencies but will not jeopardise our duty of care by working in haste.



## **Building with decommissioning in mind**

As we move towards the completion of our commercial reprocessing operations and the environmental remediation of Sellafield, so construction activities are beginning on site. Built with decommissioning in mind, the construction of new waste retrieval, processing and storage plants is essential to our ability to empty our older buildings of their legacy fuels, sludge and waste.



## **Investing in research and development**

Sellafield presents both unique challenges and unique opportunities for the brightest minds in the nuclear industry. As we complete our reprocessing operations and clean up the site, so we’re investing in research and development. With project schedules that reach into the next century, our investment in new skills and talent will nurture the next generation of nuclear pioneers.



## **Promoting innovation with unique opportunities**

As we learn more about the Sellafield site, and about the unique challenges presented by legacy fuel and waste, so our understanding deepens. Working without a blueprint to retrieve legacy waste, we’re creating a culture of both technological and scientific innovation. Designers and engineers are developing new ideas and repurposing innovations from beyond the nuclear industry.



## **Supporting our supply chain**

The Sellafield supply chain includes some of the biggest names in engineering, construction and decommissioning. As our business transforms, so an environment emerges that supports the technological advancement and promotes the growth of our supply chain.

*To see how we performed against our targets in 2018/19 see page 14.*



### **Growing global expertise in nuclear waste management**

Sellafield is the most complex nuclear site in the world. As we clean up the site, much is still unknown. The expertise, experience and current knowledge of our team and that of our supply chain, combined with emerging technologies and new learning, will cement our reputation as global experts in the safe and secure management of nuclear waste.

### **Building relationships with academia**

We're building on our existing relationships with academia, nurturing graduate talent and offering unique opportunities within the nuclear industry. As the business transforms, we'll look to universities both in the UK and overseas for emerging research, developments and innovations to support our mission to make Sellafield safer sooner.

### **Collaborating and partnerships**

Our work demands a mix of direct employment and supply chain capability. Together we are a team of more than 11,000 nuclear experts. We recognise that we can achieve more together than we can alone and work in partnership with the Nuclear Decommissioning Authority, our regulators, customers, stakeholders and our supply chain.

### **And we are transforming Sellafield...**

**We have plans in place for the clean up of Sellafield but are always looking for a better way**





# Transforming Sellafield

Sellafield is a cornerstone of UK industry, with a part to play in improving skills and lifetime costs for the nuclear industry.

We are transforming our business to improve every aspect of our performance, so that Government can make the funding choices that we need in the coming years, secure in the knowledge that taxpayers will get a good return on their investment.

Our unwavering focus is on creating value. Value is the outcome our customer wants to see. For us, this is about accelerating hazard reduction and increasing value for taxpayers' money, through improved efficiency.

## £100m

Our success has resulted in us being given an additional £100 million in order to further accelerate retrievals and deliver more work for the NDA group in 2019/20.

### Our transformation objectives

- We will deliver transformation that:
  - Accelerates the high hazard mission.
  - Reduces mission cost.
  - Reshapes and reskills our workforce for the future.
  - Increases return on investment for the taxpayer.

- Improves stakeholder confidence.
- We will develop a culture and the leadership behaviours that nurture people to:
  - Focus on delivering value.
  - Hold each other to account.
  - Work collaboratively and innovatively.
  - Take ownership of and pride in their work.
- We will create an environment for making high quality business decisions.
- We will provide Government with compelling choices for investment decisions, at the end of reprocessing and beyond hazard reduction.
- We will facilitate a long-term and positive impact that helps to ensure a resilient supply chain is in place and able to diversify.

### Measuring success

Our ambition is to:

- Accelerate the high hazard mission by 25 per cent.
- Reduce costs by £1.4 billion by 2020 and further £1-£1.4 billion by 2029.
- Be able to flex +/- £100 million in any financial year by 2020.

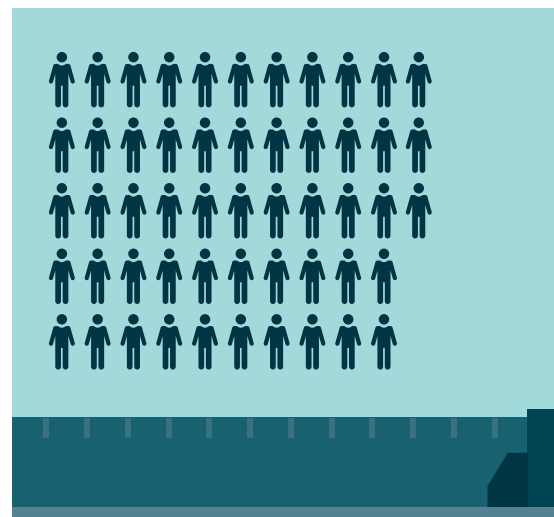


Reflecting our focus on value, we have restructured our business around four value streams:

- RETRIEVALS
- REMEDIATION
- SPENT FUEL MANAGEMENT
- SPECIAL NUCLEAR MATERIALS



We've created a new approach to performance management. **'My Contribution'** will be rolled out across the business in 2019/20.



In 2018/19 we took a step forward in the transformation of our business, focusing on both:

running the business

changing the business

**We co-created new values for our business:**



SAFETY AND SECURITY



AMBITION



INTEGRITY



INCLUSION

**Budget** £2bn

**£300m**

**We delivered our work in 2018/19 and £300m worth of savings.**



We've started the process of streamlining our management system and processes with a deep-dive review.



We created a new, modern approach to support to developing our leaders and all

**165** OF OUR SENIOR LEADERS

started to develop their skills through the programme.



We put employees at the heart of our innovation with the launch of our own Dragons' Den. Teams put forward solutions to business issues and we gave them the time and funding to develop them.

**We reskilled and redeployed 53 people**

who previously worked in the Thermal Oxide Reprocessing Plant so that they could take up new roles in the business. This meant that we were able to complete reprocessing in the plant without any redundancies.

For more information on Thorp, see page 38.

The following pages set out how we performed against our targets in 2018/19.

# Our productivity

## Corporate and Transformation

### CORPORATE

◆ Effective use of public funds to support mission delivery and pace whilst displacing inefficiencies

• Cost Reduction – Operating Plan Cost Variance



### TRANSFORMATION

◆ Change the culture and way business is done at Sellafield

• Drive sustainable efficiency and secure a reduction in roles by 500 by the end of FY 18/19



• Delivery of a Strategic Context Document that positions how the alternative delivery of shared services can support the Sellafield mission



• Sellafield Ltd Enterprise Management System blueprint, benefits realisation and programme plan approved by our Executive Committee



### FUNCTIONS

◆ Functions provide requisite support to the Value Streams and prudently run the business

• Exec, Band 2 and Personal Contract Holder Leaders – Phase 1 Leadership Development framework completed



## Delivery

### RETRIEVALS

◆ Reduction of high hazard risks from legacy sites

• First Generation Magnox Storage Pond:  
X units of inventory removed from the pond  
(X and units to be defined on a balanced scorecard basis)



• First Generation Magnox Storage Pond:  
1st transfer of D Bay sludge to Buffer Store



• Pile Fuel Cladding Silo:  
100 Production Boxes Manufactured



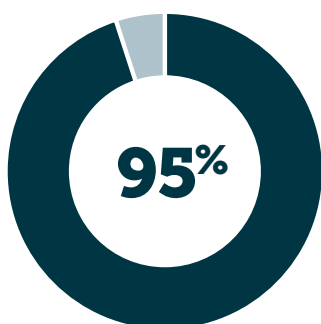
• Magnox Swarf Storage Silos:  
NDA Board approval of Outline Business Case for 3m<sup>3</sup> Boxes



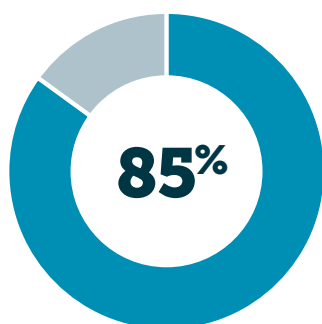
• Magnox Swarf Storage Silos:  
First skip of waste exported from the silo



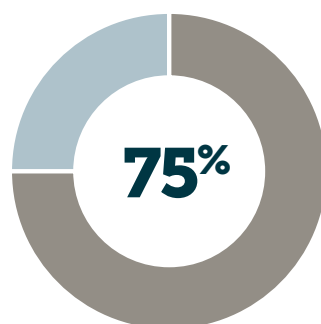
## Achievement of our Operating Plan Milestones (%)



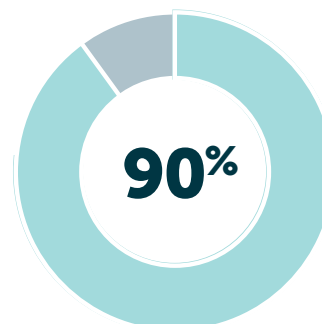
EXCELLENT



GOOD



ACCEPTABLE



YEAR END



- KEY**
- AREA
  - ◆ VALUE STREAM OBJECTIVE
  - Key targets

EXCELLENT

GOOD

ACCEPTABLE

Year End

✓ Target complete

## Delivery

### SPENT FUEL MANAGEMENT

◆ Receipt, reprocessing and storage of spent nuclear fuel

• Waste Vitrification Plant Throughput:  
Vitrification of highly active liquor (tonnes)



• Magnox: Reprocess Magnox spent fuel and Dounreay Fast breeder Reactor material (tonnes)



• Achievement of targets requires the reprocessing of corroded fuel within the overall total (tonnes)



• Completion of Thorp shear (tonnes)



### SPECIAL NUCLEAR MATERIALS

◆ Safe and secure storage and re-treat of special nuclear materials

• Finishing Line 4 – Creation of Type 1 package repacking capability for operational training



### REMEDIATION

◆ Clean-up of the Sellafield Site

• Pile 1 East Blower House Outcome Based Contract Pilot



• Silo Emptying Plant Head End Stack demolition – stack demolished to 47m



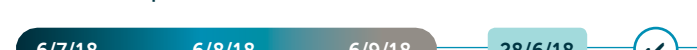
### PROJECT DELIVERY

◆ Construct the major projects required to complete our mission

• Box Encapsulation Plant: Delivery and installation of Waste Treatment Complex high level pipework, tertiary steelwork and pipe supports including inspection



• High security area 2 Physical Boundary Plinth and Fence Complete



• Main Site Command Facility – installation complete



• Sellafield Product and Residues Store Retreatment Plant – Substation relocation installation and pumped water services diversions construction complete



• Safety & Security: Cyber – Forensic Commissioning Complete



• Silo Maintenance Facility – Completion of Inactive Safety Commissioning



• Programme & Project Partners



## Performance Modifiers

### SAFETY, SECURITY & FINANCIALS

◆ Safe, Secure Site Stewardship Return on Investment Demonstrable Progress



# We're carrying out the environmental clean-up of the most complex and hazardous nuclear site in the UK.





## Introduction to the legacy ponds and silos

### *Our highest nuclear risks and hazards at Sellafield are two fuel storage ponds and two waste silos.*

These four buildings, our legacy ponds and silos, are more than sixty years old. They are home to nuclear fuel, sludge and waste, some of which date back to the start of the UK's nuclear industry and to Sellafield's early roles in national defence and electricity generation.

These facilities were built to the standards of the 1950s and '60s and they were not intended for waste retrievals or long-term storage of waste.

Removing the inventory therefore carries a level of urgency. We have to work with the plants as they were built – and they weren't designed with decommissioning in mind. So our work to remove the inventory has to balance urgency with uncertainty, and reach a compromise between modern requirements for engineering solutions and the congested areas of work.

Here is an overview of the progress that we have made in the clean-up of these priority buildings.

The performance of our processing plants can be quantified in terms of tonnes or numbers of containers. Other aspects of our work, particularly in risk and hazard reduction are harder to quantify. In these instances our performance is measured on a range from acceptable to excellent.

**See the case studies >**





# First Generation Magnox Storage Pond

The First Generation Magnox Storage Pond was used to receive, cool, and process used nuclear fuel from the UK's nine Magnox nuclear power stations, as well as fuel from Italy and Japan. We need to retrieve fuel and sludges from the pond which is classed as the second highest hazard at Sellafield.

This year the programme achieved above and beyond its targets in terms of the volume of waste exported from the pond.

Our most stretching target this year was to export 225 units of inventory but in fact we achieved 295 units. Even more impressive is that 52 of those units were exported when the Skip Handler Machine was in outage.

Our Skip Handling Machine is the main crane which goes over the top of the pond and allows us to lift and move the waste skips under the water. When it was due to be out of service for several weeks for maintenance the team found ways to carry on getting waste out by using a new retrieval tool controlled by remotely operated vehicles (ROVs).

## New capability in

### Significant steps forward were made this year in installing the new In-Pond Manipulator.

Installed on the pond floor, it can lift skips and sort and segregate the contents using an array of tools. This year we:

- Cleared space on the pond floor for the manipulator.
- Installed the main sections.
- Strengthened some of the surrounding areas.

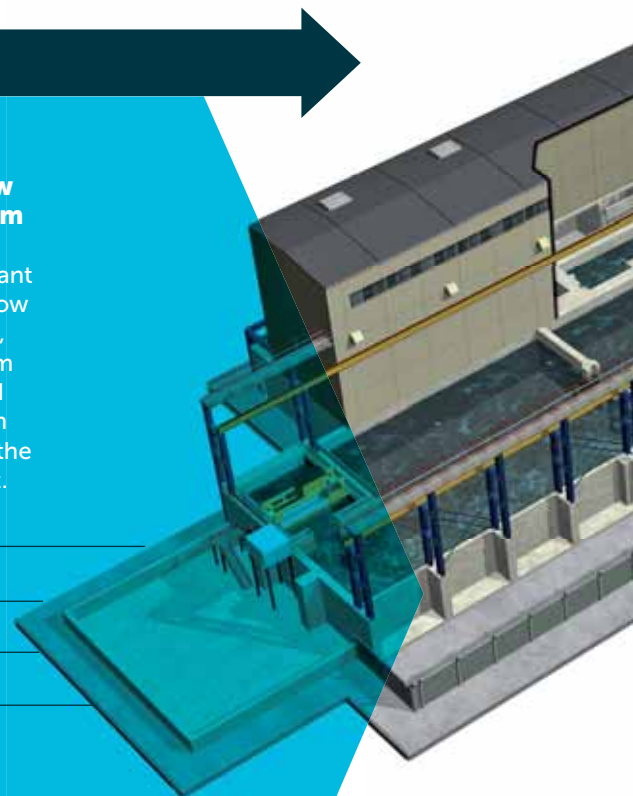
### We installed a Crevice Sludge Retrieval tool to help us retrieve the 1,500m<sup>3</sup> of sludge from the pond.

It can get into parts of the pond that our other sludge removal tools can't reach, such as gaps between skips.

### We started to use a new sonar system in the Sludge Packaging Plant to monitor how much sludge, retrieved from the pond and wet bays, is in each tank in the storage plant.

### Self-Shielded Boxes will store skips of zeolite waste

(zeolite has traditionally been used to keep dose levels in the general pond area to a minimum). The first 'pour' of steel to make one of these boxes was made in June 2018, but it has taken longer than expected to get the manufacturing process right. Therefore we missed the target of exporting the first zeolite skip to the new Interim Storage Facility by February 2019.



**We exported sludge from D-Bay in November 2018.**

This is where most of the sludge is concentrated and close to the surface, making it the most hazardous area of the facility and a no-go area for the past 40 years. The retrieval was 10 years in the making, cost £336m and involved around 800 people from our company and the supply chain.

**We exported four empty skips out of the pond,**

a massive step forward in tackling the major 'clutter' problem in the pond. The empty Magnox skips are put into shielded storage containers and stored on site.

**In December 2018 we exported the first batch of aluminium-clad fuel out of the pond.**

By the end of the year we had exported 18 tonnes, far exceeding our target.

**38 tonnes**

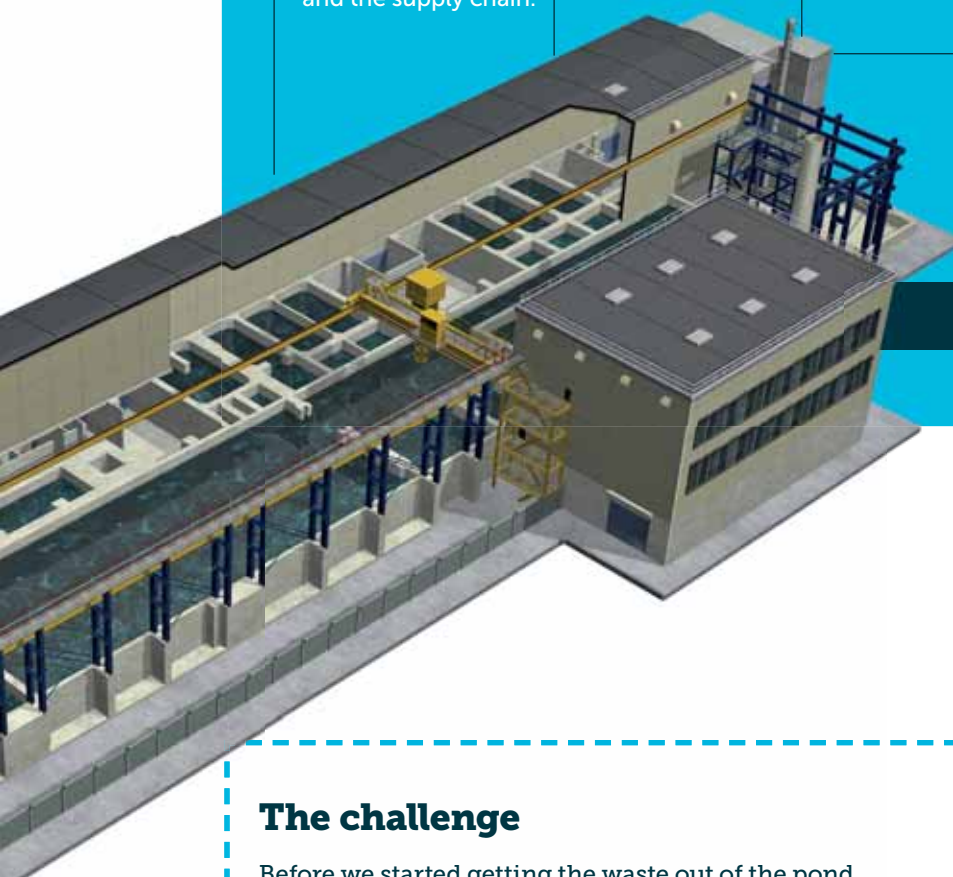
We exported 38 tonnes of fuel, meaning we have now removed nearly a quarter of the fuel since starting exports in 2016.

**16 packages**

We removed 16 packages of waste from the wet bays.

**34.6m<sup>3</sup> sludge**

We transferred 34.6m<sup>3</sup> of sludge.



**Hazard out**

**The challenge**

Before we started getting the waste out of the pond, the estimated waste volumes were:



**14,000m<sup>3</sup>**

of contaminated water



**1,400m<sup>3</sup>**

of radioactive sludge



**500**

tonnes of irradiated (degraded) solid nuclear fuel



**2,100m<sup>3</sup>**

of solid intermediate level waste



# Pile Fuel Storage Pond

Originally designed to receive and cool nuclear fuel from the Windscale reactors, the Pile Fuel Storage Pond is our oldest storage pond.

It was adapted several times throughout its operational life, receiving a 'Heinz variety' of exotic and unique fuels from test and research facilities from the UK and abroad at the birth of the nuclear age.

Therefore the programme has had to adapt and innovate in finding new homes for this cocktail of isotopes, radioactive cartridges, nuclear 'pennies' and so-called nuclear 'ammunition boxes' containing various radioactive materials.

The pond has always been the 'lead and learn' facility for tackling the bigger problem of the First Generation Magnox Storage Pond. Its mantra is 'first filled, first emptied'. This year saw some further significant strides in removing the inventory.

**The Challenge**

Before starting to get the waste out, there was an estimated...

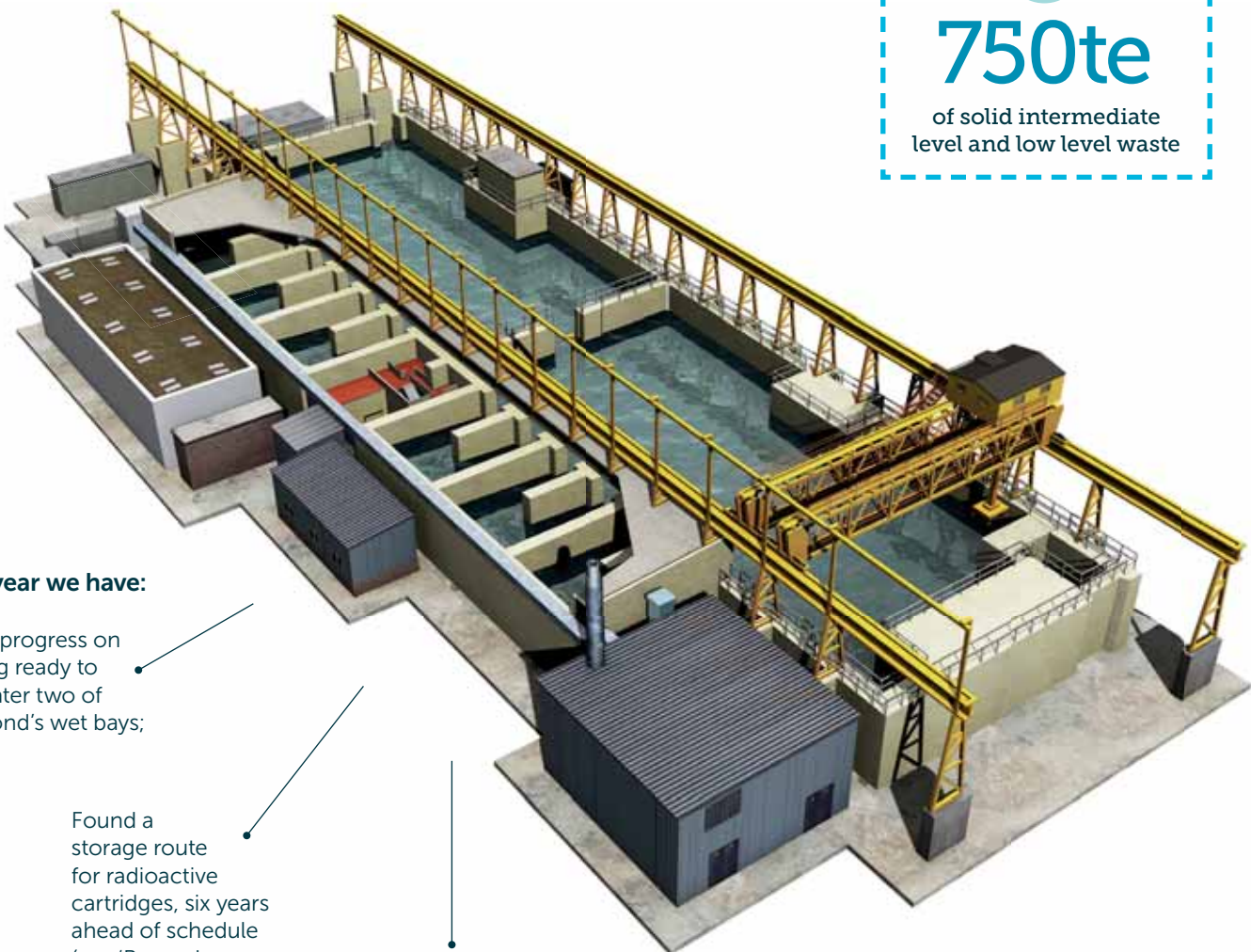
**323m<sup>3</sup>**

of sludge in the pond

as well as

**750te**

of solid intermediate level and low level waste



**This year we have:**

Made progress on getting ready to de-water two of the pond's wet bays;

Found a storage route for radioactive cartridges, six years ahead of schedule (see 'Removing a radiation hotspot' panel, right);

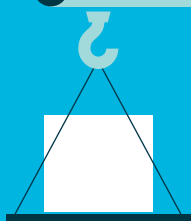
Removed skips and solid wastes from the pond.

## De-watering a nuclear pond

### HOW DOES IT WORK?

You start in two of the wet bays.

**1. REMOVE THE SOLID WASTE.**



**2.** Use a Grindex snake pump to remove sludge from the bottom of the bays.



**3.** Use a JCB micro digger to shovel up and sort the radioactive debris.



**4.**

Descal and shave the walls as the water level lowers to remove contamination.



## Also this year

The team and our supply chain partners have:

- ✔ Passed the important benchmark of removing **300 tonnes** of solid waste from the pond.
- ✔ Emptied the radioactive contents of **26 skips** so that the empty skips are ready for removal.
- ✔ Removed **16 empty skips** from the pond for good. At the end of the year we had got half way through the job of removing skips from the pond, with fewer than 100 skips remaining.
- ✔ Sent **10 skips** of Intermediate Level Waste for safe storage.
- ✔ Emptied two of the pond's wet bays of **61 tonnes** of irradiation old machinery and discarded metallic waste.
- ✔ Completed a **survey** of how radioactive sludge is spread out across the pond floor using remotely operated vehicles. This allows us to plan our desludging tactics.

## Removing a radiation hotspot

In the early 2000s we installed IONSIV cartridges in the pond's effluent treatment plant. They acted like sponges, effectively soaking up radiation and reducing dose levels for workers in the general pond area.



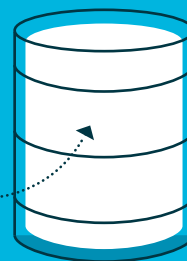
### Our experts worked for **2 years**



Working with James Fisher Nuclear Ltd we found a new disposal route: our waste encapsulation plants.

The original plan was storage in the Box Encapsulation Plant from 2025.

The cartridges will now be grouted in steel drums.



We have already moved the first **10 cartridges**

6 years ahead of schedule



## REMOVING

# 10%

of the remaining radioactive content of the pond.



# Magnox Swarf Storage Silo

The Magnox Swarf Storage Silo was constructed for the underwater storage of swarf waste, which is the external cladding removed from Magnox nuclear fuel. Three extensions to the building meant that we were left with 22 individual 16-metre-deep waste compartments.

Since it stopped receiving waste 20 years ago, the people working at our most hazardous legacy facility (and probably the most hazardous building in Western Europe) have been doing three main jobs:

- Managing the storage of the historic waste day-to-day so the facility remains safe.
- Preparing for the start of waste retrievals by upgrading and strengthening the old building and installing new retrievals equipment.
- Reducing the hazard by lowering the radiation levels in the liquor which covers the waste.

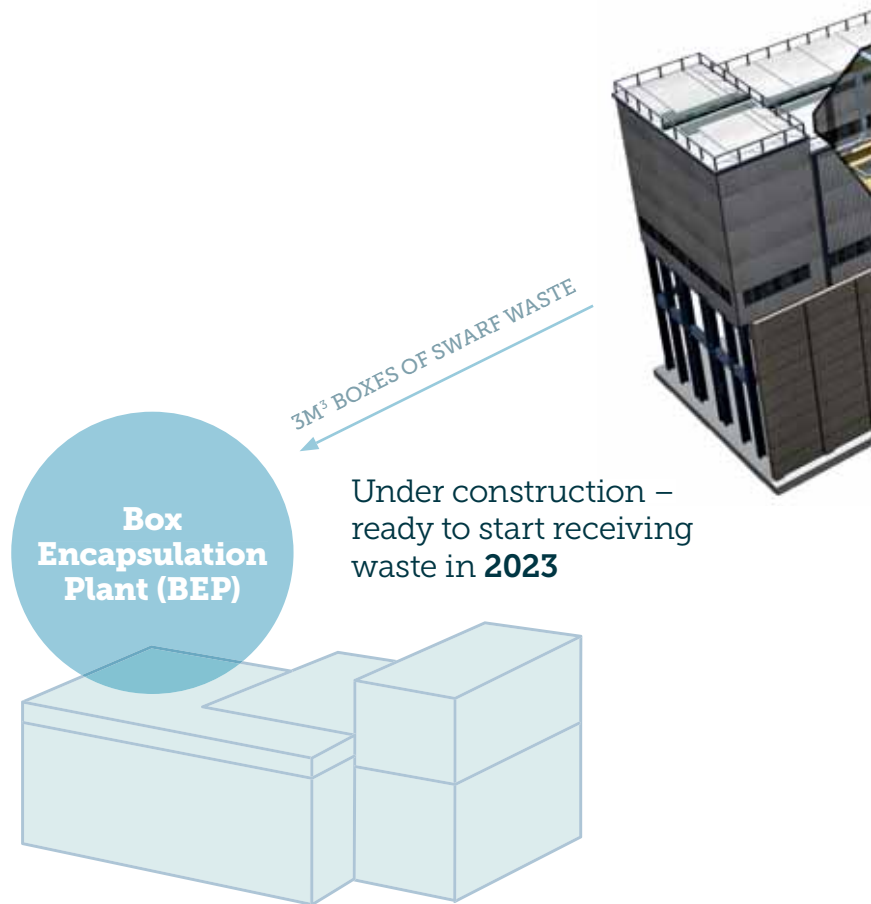
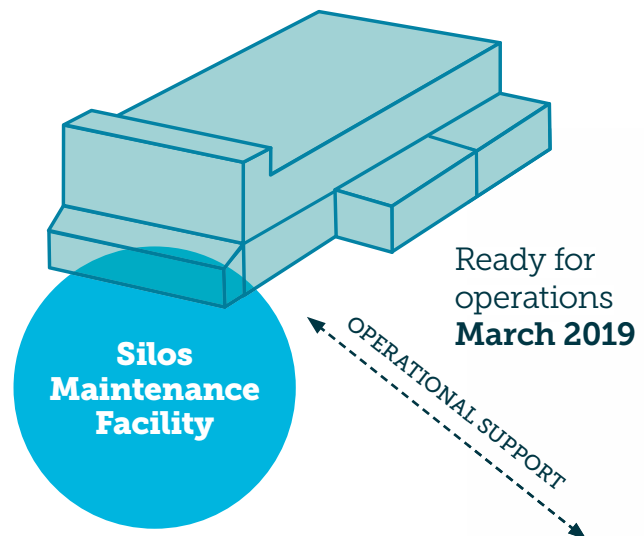
Our plan for 2018/19 was to be ready to retrieve waste by the end of the financial year, with a view to actually starting retrievals in September 2019. This timescale has moved back by 3-6 months, but the team still made significant progress to prepare the plant for retrievals.

The scale of the task at hand is enormous – each of the 22 waste compartments is big enough to hold six double decker buses.

Three Silo Emptying Plant machines will lower a grab into the waste, pick it up, and pack it into a skip that then goes into a 3m<sup>3</sup> box for export.

The first of the Silo Emptying Plant machines is already in position and is being commissioned.

By 2022 we will have all three machines in position and we predict it will take until 2046 to empty the silo.



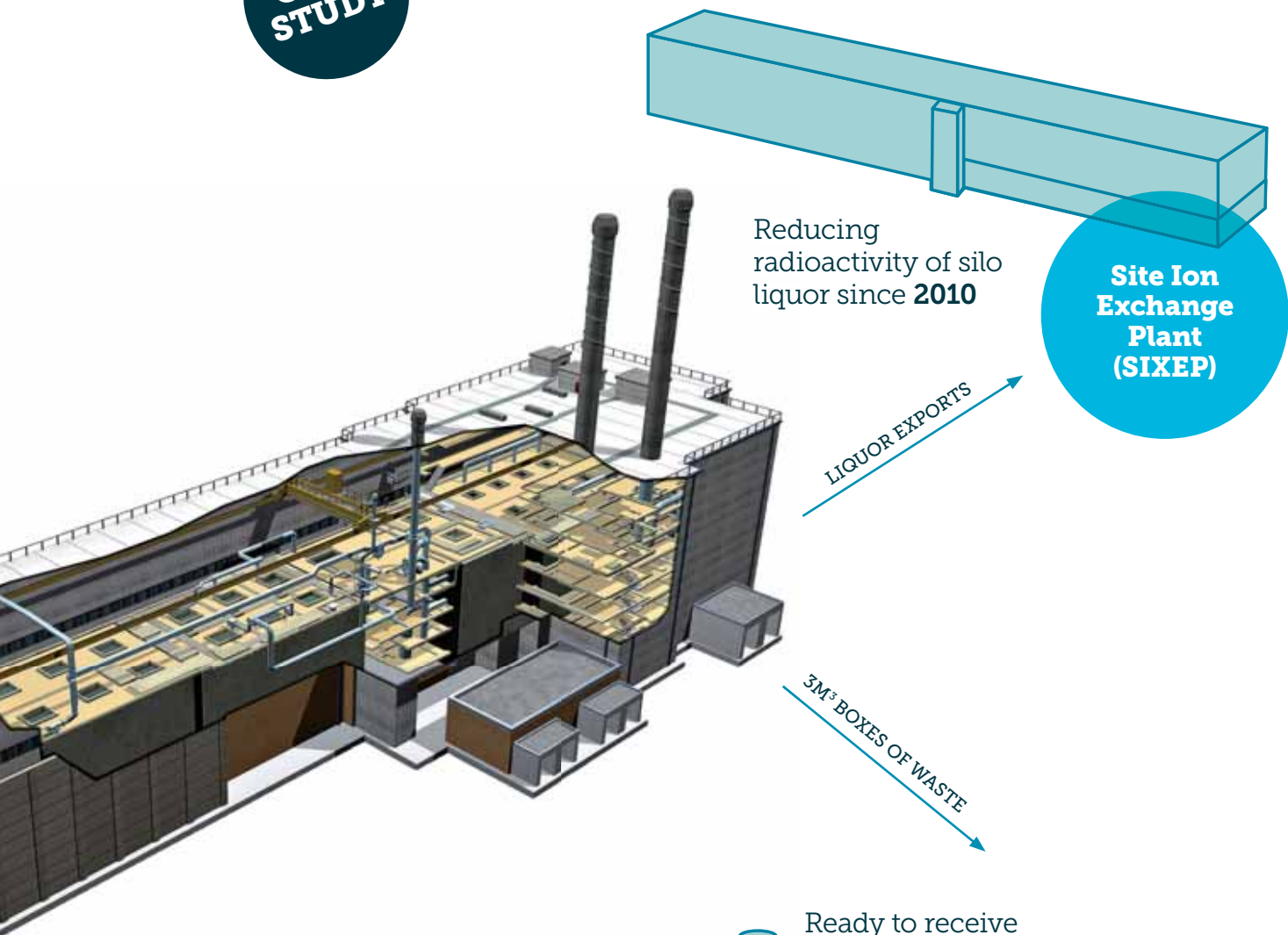
## In 2018/19 we:

Started to **transfer liquor** from the first extension of the plant into the **third extension** so that it can be transferred to the Site Ion Exchange Plant for treatment. The first extension was previously impossible to access but the team used remotely operated vehicles to link up hydraulic pipes that were part of the plant's original overflow channel to provide a route for the liquor.

Lifted the **22nd** and final **roof plug** at the top of the waste compartments.

Installed the **Nitrogen Generation Plant** we need to carry out retrievals.

**CASE STUDY**



**The challenge**  
 We need to remove approximately  
**10,000m<sup>3</sup>**  
 of waste  
 made up of an estimated  
**60,000**  
 individual items  
 of miscellaneous radioactive  
 metal waste.



Installed the first **charge hole seating plate** – the engineered interface between the emptying machine and the silos – at the top of the first compartment we'll be retrieving from.

Received enough transfer packages from our manufacturer to **start retrievals**. We need a minimum of five to get started and will eventually have a fleet of 24.

Completed **all 23 inactive safety commissioning tests** on the silo emptying plant installed inside the legacy facility.



# Pile Fuel Cladding Silo

We started and ended 2018/19 in a good position, with the programme to open this legacy ‘locked vault’ on schedule and on budget.

At the start of the year six holes had already been cut out of the side of the silo to grant access to the ILW inside and six huge doors were safely covering the holes, ready to be lifted up when we reach into the silo with our crane and grab the waste inside.

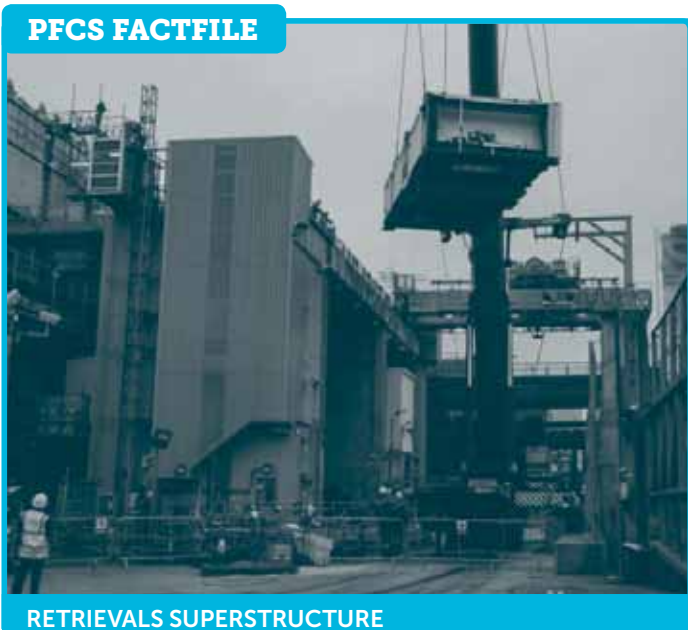
This year has been all about manufacturing and installing the retrievals equipment onto the superstructure we’ve built next to the

silo; this will enable ‘Early Retrievals’ from the silo. At the same time we’ve made good progress on planning the work needed to get the waste out of the other compartments.

Through our supply chain partner Bechtel Cavendish Nuclear Solutions we’ve sourced the equipment to safely carry out this task from all the UK and further afield.



So that we can hit the ground running when we’re ready to get the waste out, we have already been training our operators on how to use the equipment on a simulated virtual crane which exactly mimics the real thing.



PFCs FACTFILE

RETRIEVALS SUPERSTRUCTURE

The **Pile Fuel Cladding Silo** is Sellafield’s **oldest** nuclear waste storage facility



It is **21m high** and houses **six** individual waste containment compartments

In total it holds over **3,400 cubic metres** of intermediate level waste, the equivalent of **30 double decker buses**



**3m<sup>3</sup>** x **2,200**

The waste will be stored in an estimated **2,200 3m<sup>3</sup> boxes**

## Finances

Getting us to the point we’re ready to get the waste out will have cost £480m. That includes: building the retrievals superstructure next to the silo, cutting the six holes in the side of the legacy store, cutting up the deflector plates which were inside it, installing the six doors on the side of the silo, manufacturing and installing all the retrievals equipment, preparing the goliath crane next to the silo, plus many other jobs needed to open this ‘locked vault’ and get the waste out.

In terms of future costs we think it will cost another £390m to do everything needed to empty all six compartments – that includes the costs of manufacturing the 2,200 3m<sup>3</sup> boxes, building the extra equipment needed to get the waste out of the other five compartments, and all the costs of carrying out 10 years of retrievals operations.

## Delivery dates

We plan to be ready to retrieve waste in July 2019 – but will only be able to remove the deflector plates until BEPPS DIF is ready to accept waste (expected to be Summer 2020 – see right). Once waste retrievals start, we think it will take two years to empty compartment 5. Assuming BEPPS-DIF opens in 2020, we think it will take until 2030 to empty all six compartments, but clearly that date will be informed by how quickly we empty compartment 5.

### A nine-piece solution

The equipment to get the waste out comprises nine different Pre-Assembled Units which were manufactured, tested and commissioned up in Rosyth by Bechtel Cavendish Nuclear Solutions through Babcock Marine Technologies before being disassembled, transported down to Sellafield one by one and then reassembled on the retrievals superstructure next to the silo.

The modules include the mechanism for sealing onto the silo opening and the areas where waste is transferred from the crane grab into 3m<sup>3</sup> boxes and then hoisted down below. They also include all the necessary services and operators' room.

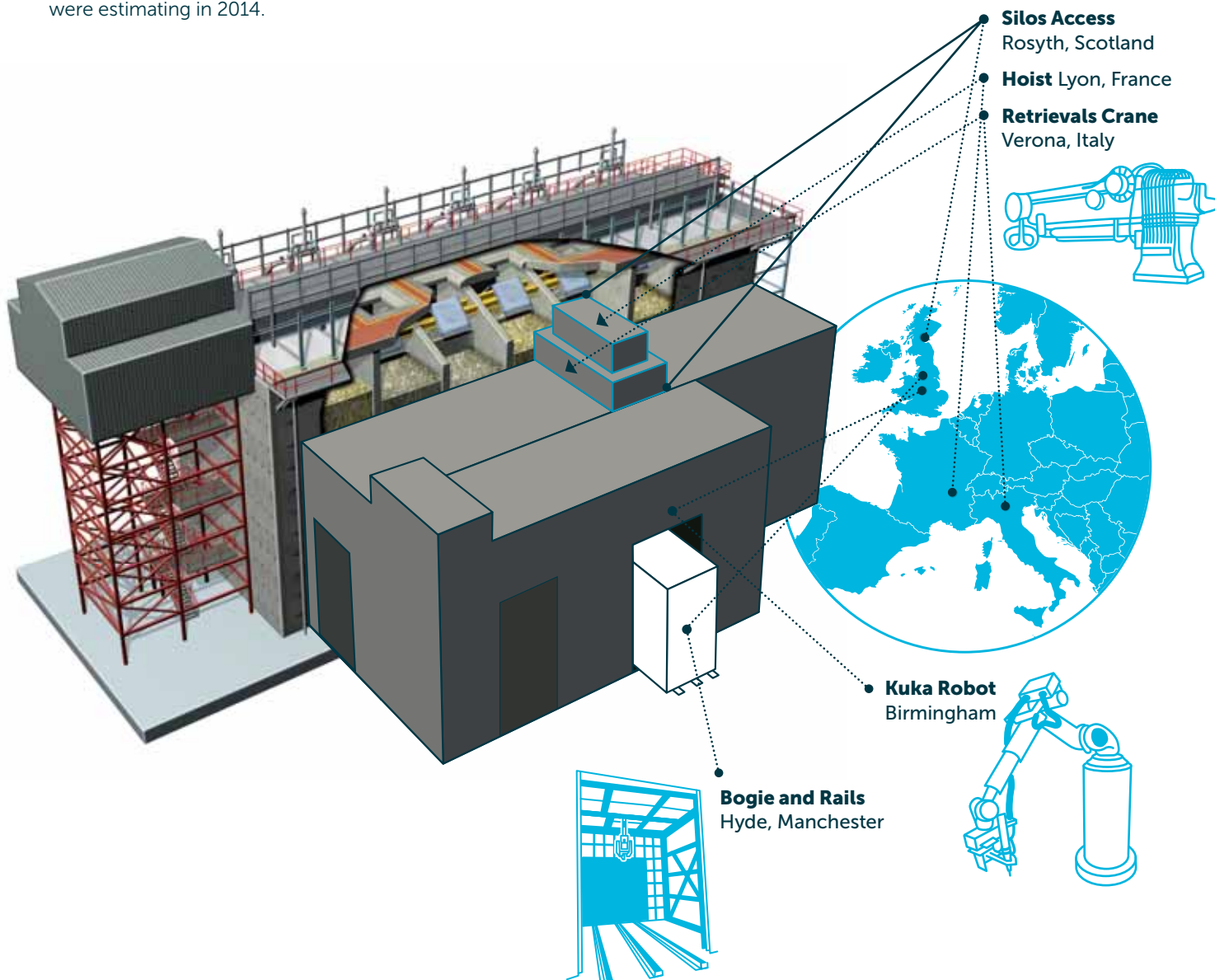
It has taken 18 months to design and 18 months to manufacture, test and commission the equipment – a very tight timescale for a nuclear process and three years ahead of the schedule we were estimating in 2014.

### The challenging bits of the jigsaw

Although we met our 2018/19 targets in terms of installing the retrievals equipment, there were two important enabling areas where we didn't perform as well as anticipated.

The first was in the production of the 3m<sup>3</sup> boxes which will be storing the waste in an interim store before their eventual final destination in a geological disposal facility. We started the year with a target of having manufactured 100 of these duplex steel containers through our manufacturers Darchem and Metalcraft. However, the production process has taken longer than expected and 22 were manufactured and delivered to Lillyhall by the end of the financial year, starting a steady stream of deliveries for retrievals.

The plant which will receive and store 3m<sup>3</sup> boxes of waste, the Box Encapsulation Plant and Product Store-Direct Import Facility (BEPPS-DIF), was not available as originally scheduled in 2019 due to construction delays. A revised business case, now being delivered directly through us as the contracting authority, schedules the first 3m<sup>3</sup> box being delivered into BEPPS-DIF by summer 2020.





# A year at Sellafield

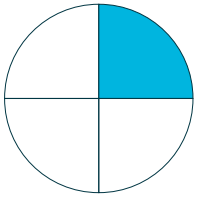
*When your mission will take more than a century to complete it can be difficult to measure success by looking only at what has happened in one year.*

*Achievements are sometimes stepping-stones, or incremental steps towards a goal that we are working towards in five, ten, or fifty years time.*

*Then, occasionally, you get a year like 2018/19. A year that features not only these stepping-stone achievements but also the successful (and safe) completion of a longer-term mission.*

*This year we completed our 25 year mission to reprocess Oxide fuel from across the UK and around the world in our Thermal Oxide Reprocessing Plant.*

*But that's only part of our 2018/19 story.*



# Quarter 1

April-June 2018

## We invested £2.6m to create a Cumbria business hub

The investment will be used by developer BEC to regenerate a former bus station in Whitehaven into a multi-million pound business hub. Alongside units for fledgling firms, the ambitious plan includes:

- Conference and meeting space for 75 people.
- An artisan food and drink outlet, open to the public.
- Health and wellbeing facilities.

## We launched a campaign to challenge mental health stigma

Our employees joined their colleagues from across the NDA Group to share their personal stories as part of a national campaign to end the stigma associated with mental health issues.

The This is Me campaign was created by Barclays in association with the Lord Mayor's Appeal in the City of London and is designed to challenge the stigma around mental health at work and aims to break the culture of silence by supporting people to tell their own stories.

The North West launch was the first time that the campaign has been launched outside the capital.

## We tackled our biggest risk yet

Our teams removed highly radioactive 'liquor' from one of the oldest parts of the Magnox Swarf Storage Silo for the first time.

The material has been inside the waste store for many decades.

It was created when water was used to cover the waste so it could not ignite.

New networks of heavily shielded pipes have been built to help get take the material out of the building.

**i** For more on our progress in cleaning up the Magnox Swarf Storage Silo, see our case study on page 22.

## We made game changing progress in a legacy pond

For the first time, empty nuclear fuel skips have been removed from the floor of the First Generation Magnox Storage Pond – one of the most hazardous facilities in Europe – and a Cumbrian company played a key part.

The breakthrough came after our team worked with Appleby-based engineering firm Barrnon to make containers to safely store the skips elsewhere on the site.

They worked together to add extra shielding and wooden braces to 50 shipping containers, enabling an initial 100 skips to be removed from the pond.

More than 1,200 Magnox skips rest on the floor of the pond, which was originally used to store nuclear fuel for atomic weapons.

Clearing them out makes it much easier to remove other hazards like sludge, a by-product formed from decaying nuclear fuel, algae, and other debris.

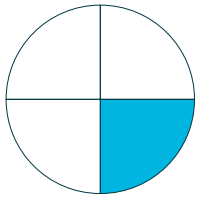
It gives us the elbow room we need to crack on with the waste retrievals and is the latest example of how simple solutions are delivering hazard and risk reduction on the site.

**i** For more on our progress in cleaning up the First Generation Magnox Storage Pond, see our case study on page 18.

## We learned from a cable strike on the Sellafield site

During construction works for a new steam generation plant at the Sellafield site, an underground electricity cable was struck, leading to a temporary dip in power to parts of the site. No one was injured as a result of the cable strike and there were no environmental consequences. We carried out a thorough investigation and shared learning from the event – including the potential consequences – with the rest of the business and our contractors.

We received an Improvement Notice from the Office for Nuclear Regulation that required us to review, revise and implement our excavation arrangements. We have closed out all actions from this notice and have new excavation arrangements in place. We are undertaking a series of site-wide improvements to construction design management arrangements to embed further learning.



# Quarter 2

## July-September 2018

### We chopped our biggest chimney down to size

One of the most daring demolition projects ever undertaken at Sellafield has reached a key point in quarter two.

The site's tallest chimney is being brought down brick-by-brick using a platform that climbs up the structure itself.

Our employees, along with their team mates from Nuvia and their sub-contractors Delta International and Alimak Hek, have been working to remove the concrete and steel structure by hand at a rate of one metre a week.

The painstaking approach is necessary because the 61m chimney sits on top of an old nuclear reprocessing plant and is surrounded by buildings containing hazardous material.

That means traditional explosive, compressed air, or water-related demolition techniques can not be used.

The team has safely demolished 15 metres of the stack, taking a quarter off its height. That meant that it no longer posed a risk to any of the nuclear plants that stand around it.

### We changed the way we travel to work at Sellafield

To clear space for future decommissioning projects, we need to remove 1,300 parking spots on the site and maximise the value of land on the site.

We introduced a series of new travel to work options in February, including park and ride bus services and direct commuter coaches. With a reduction in 500 vehicles a day accessing the site, we launched the next phase of travel improvements in July.

These included:

- A requirement for vehicles entering the site to have 3 or more occupants.
- Minimum occupancy of 2 people or more for vehicles using the off-site Yottenfews car park.
- A new car sharing database.

**i** For more on our travel and access programme, see our case study on page 46.

### We celebrated another UK first for the Project Academy

Our employees became the first in the UK to complete a brand new scheme in project scope baseline management through the Project Academy for Sellafield.

The Project Academy for Sellafield is the first of its kind in the UK.

It was launched 2 years year ago to help increase project capability across the country, and now has more than 1,300 students on its books.

It is delivered by the University of Cumbria along with six partners, and is becoming the gold standard model for project training, replicated by companies across the world.

### We launched our Social Impact Strategy

We recognise the social and economic impact of Sellafield on our neighbouring communities. We are part of our communities and in July we stepped forward to help leaders in West Cumbria respond to the economic challenges facing the area.

Our Social Impact Strategy outlines five objectives which will help local leaders to secure inward investment

and diversify the local economy, as reprocessing at the site nears completion.

As our mission to clean up Sellafield accelerates and reprocessing comes to an end, we are looking towards what the future of our business will be. Given the reliance of the local economy upon Sellafield, what we do will inevitably shape the future of the local economy in a significant way.

The long-standing economic challenges facing West Cumbria are understood by all of us who live and work here – and one of the biggest is over-reliance on the nuclear industry.


This isn't purely Sellafield's problem to fix – but we know that we have a role to play.

By working together with the community we can leverage the investment that government makes at Sellafield – currently over £2bn a year – to create sustainable growth by both diversifying the economy and reducing West Cumbria's reliance on Sellafield.

*The site's tallest chimney is being brought down brick-by-brick using a platform that climbs up the structure itself.*







*Rope access team clearing ledges within chimney in preparation for the installation of the giant crane.*



## Quarter 2 | July-September 2018 *continued*

### **We took a step forward in Sellafield's most hazardous building**

Work to empty the Magnox Swarf Storage Silo took a significant step forward when a waste transfer package was lifted into the building for the first time.

The 50-tonne package was safely placed onto one of three machines that will begin grabbing waste out of the building's 22 silo compartments from next year.

Originally constructed as six silos in the 1960s and then extended three times, the silo stores magnesium cladding or 'swarf' that was stripped from Magnox fuel prior to reprocessing.

The swarf is stored underwater in the 16 metre-deep silos but over time the magnesium releases heat and hydrogen meaning the facility requires constant management and monitoring.

Since the early 1990s this type of waste has been immobilised in concrete

instead as this makes it more passive and practical to manage.

The radioactive inventory and lack of modern standards in the silo makes it the most complicated and highest-priority mission in the Nuclear Decommissioning Authority's estate.

Preparations for removing the 11,000m<sup>3</sup> of historic waste from the silos and placing them into safe, modern storage have been over twenty years in the making.

Next year three 360 tonne Silo Emptying Plant machines will start reaching in to the silos and removing the waste with a hydraulic grab.

The waste will then be loaded into the shielded transfer packages and safely stored on the Sellafield site until a permanent geological disposal facility is constructed.

**i** For more on our progress in cleaning up the Magnox Swarf Storage Silo, see our case study on page 22.

### **We announced a £20,000 donation to Egremont Crab Fair**

The Crab Fair is one of England's oldest events – turning 751 in 2018 – so we were happy to make a donation that would not only help safeguard the future of the event but also help other community events in the area.

The donation has been used to fund ground protection mats, which will enable vehicles and displays to access the sports field whatever the weather.

They'll also be a valuable asset for other community organisations, as the Crab Fair Committee linked up with the organisers of Distington Vintage Rally and Eskdale, Gosforth, Wasdale and Ennerdale County Shows to make the funding bid – with everyone benefiting from the mats.



## We brought in a giant crane to help bring a historic chimney down

We constructed a 152m crane (that's just a few metres shorter than the Blackpool Tower), the final step in our preparations to pull down the Windscale Pile One chimney.

The 110m structure – the scene of Britain's worst nuclear accident – will begin to disappear later this year with the team removing and lowering chunks of the chimney, cut out using diamond wire saws.

**i** For more on our progress in cleaning up the Windscale Pile One Chimney, see our case study on page 44.

## We watched northern businesses power our clean-up work at Sellafield

A chain of northern companies started to manufacture containers to store radioactive waste from one of the UK's most important nuclear decommissioning projects.

Businesses in West Yorkshire, Lancashire, and Cumbria are joining forces to produce self-shielded boxes which will store legacy waste from the First Generation Magnox Storage Pond.

The 66-year old open air pond was originally used to store nuclear fuel from the UK's first generation of nuclear power stations.

The clean-up work requires the manufacture of hundreds of boxes to store material taken out of the facility.

The final number needed is still to be decided but the work could ultimately be worth between £50m and £100m.

The 33-tonne metal containers begin life in Brighouse, near Huddersfield, where expert craftsmen at Arthur Jackson & Co make intricate wooden 'patterns' to create moulds into which molten iron can be poured to cast the boxes.

Next, the Shakespeare Foundry, in Preston, make the mould and pour the iron, which takes a month to cool.

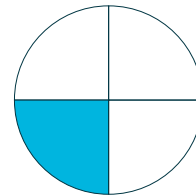
The next destination is Eaves, a Blackburn-based company, which carries out precision machining to make holes for process ports, filters and bolts.

The final step of the first boxes' journey is Workington-based TIS, where seals, filters, process ports and bolts are assembled before they are transported to Sellafield.

**i** For more on our progress in cleaning up the First Generation Magnox Storage Pond, see our case study on page 18.



*We developed a programme, that will be delivered and managed independently by the Cumbria Apprentice Training Agency.*



# Quarter 3

**October-December 2018**

## **We gave Cumbria a boost with 50 new community apprenticeships**

We unveiled plans for a new 'North West Nuclear Community Apprenticeship Programme' that will fund 50 new apprenticeships a year for small companies in Cumbria.

The courses offered will range from customer services, property maintenance and scaffolding to potentially more diverse professions like logistics and horticulture.

Although we developed the programme, it will be delivered and managed independently by the Cumbria Apprentice Training Agency, who will work with the employers, employment agencies and a range of local training providers.

It is supported by the Nuclear Decommissioning Authority, Nuclear Skills Strategy Group, Cumbria Local Enterprise Partnership and the Britain's Energy Coast Business Cluster.

We are the first company in the UK to run the scheme, which will then be rolled out all over the country.

With no upper age limit, it will provide local people with accessible paths to professional qualifications and employment, and enhance the skills of the broader Cumbrian workforce.

A range of small companies will be identified as host employers in the coming months, and will be matched to apprentices once they are recruited next year.



# We completed the final shear of used nuclear fuel in the Thermal Oxide Reprocessing Plant.

## We had a double win at the Engineering Construction Industry Training Board Awards

We were delighted to be named 'Large Employer of the Year', but the real thrill of the evening was seeing our employee Laura Pugh take the title of 'Young Apprentice of the Year' at the annual ECITB awards event in London.

The awards celebrate the brightest and best from the engineering construction industry, including those delivering world class education and training.

Laura, aged 23 from Workington, was praised for her commitment to learning and her work to inspire younger people to pursue STEM subjects.

Having completed an apprenticeship in electrical design, she is now an electrical and instrumentation designer at the nuclear site, while working towards a degree with the University of Cumbria.

## We watched our team and supply chain shine at global awards

Our employee, Rojar Ferchy, scooped the 'Young Industrialist Award' at the annual Institute of Chemical Engineers awards, which celebrate the achievements of chemical engineers around the world.

Rojar was recognized for her outstanding professional and personal achievements, having moved to the UK from Iran in 2006 before learning to speak English at the age of 17.

She has since excelled in her training and career at Sellafield as a passionate advocate of chemical engineering.

Judges were particularly impressed by Rojar's personal dedication to voluntary work, using her free time to mentor aspiring engineers, help on water and sanitation projects abroad and teach English within refugee camps in Iran and Turkey.

We have been working hard to change the way that we work with our supply chain, moving increasingly towards closer working and collaboration. We were thrilled to see this new approach recognised at the awards.

The 'Team Award' went to a team made up of our employees and colleagues from Progressive Alliance and AXIOM for their work to build a new facility to enable long-term storage of nuclear material at Sellafield.

Teams from Jacobs, Atkins and our own organisation were also highly commended for their work in the First Generation Magnox Storage Pond and Evaporator Delta projects.

## We came to the end of an era as Thorp reprocessing ended

The site's Thorp plant completed its 24-year mission to reprocess spent nuclear fuel from around the world.

Opened in 1994, Thorp is one of only two commercial nuclear fuel reprocessing plants in the world.

It has reprocessed more than 9,000 tonnes of fuel from 30 customers in nine

countries around the world. It generated an estimated £9bn in revenue.

The last batch of fuel to be reprocessed began its journey through the plant at 11.32am on Friday 9 November.

There will be no redundancies as a result of the switch-off. All employees in roles no longer required have been offered alternative jobs in the business.

Thorp will continue to serve the UK until the 2070s as a storage facility for spent fuel.

**i** For more on our work in Thorp, see our case study on page 38.

## We celebrated a triple tonne triumph

Our Pile Fuel Storage Pond passed an important point in its clean-up journey with the removal of 300 tonnes of solid waste from the legacy pond.

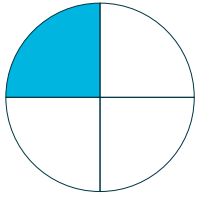
When retrieval operations in the Pile Fuel Storage Pond started in 2012 there was an estimated 750 tonnes of bulky waste items to remove, including redundant equipment and discarded skips.

The 300 tonne mark was achieved in November with the removal of the 89th skip.

There are now 97 skips remaining, which along with the other bulky waste should be fully removed and in safe interim storage by 2024.

**i** For more on our progress in cleaning up the Pile Fuel Storage Pond, see our case study on page 20.





# Quarter 4

## January-March 2019

### Robots helped us tackle Sellafield's notorious radioactive 'hot spot'

Robots at Sellafield started to remove radioactive sludge from the most hazardous spot on the site.

The radioactive 'hotspot', known to those at the site as 'D-Bay', is a sub-section of the First Generation Magnox Storage Pond.

The area was used to deposit radioactive sludge which started to accumulate in the plant in the 1970s.

The sludge is now being carefully 'hoovered up' using robotic arms, following 10 years of planning with supply chain partners ACKtiv joint venture and Jacobs.

D-Bay holds the equivalent of 35 concrete mixer trucks full of radioactive sludge, which is a by-product formed from decaying nuclear fuel and other debris.

It has been a no-go area for around 40 years, due to the proximity of the sludge to the surface of the water and the sheer volume of radioactive material.

The work has been done remotely using 'Brokk' manipulator robots, operated by people who control them from behind a shielded wall.

The robotic arms are attached to an overhead travelling crane and various tools can be attached to the arm for different tasks.

A suction device is used to 'hoover' up the sludge, while other tools allow the arm to pick up larger waste items and chop them into smaller pieces (referred to by operators as 'giving a haircut'), so that the sludge can be accessed more easily.

The material is being transferred to a state-of-the-art plant for safe storage.

**i** For more on our progress in cleaning up the First Generation Magnox Storage Pond, see our case study on page 18.

### We worked differently with our supply chain with benefits for SMEs

A large amount of the work reducing the hazard and risk on the Sellafield site is done by our supply chain partners.

Specialist jobs such as demolishing chimneys, taking the water out of nuclear storage ponds and dismantling asbestos lined buildings require experts in their field.

The Decommissioning Delivery Partnership is a framework made up of these nuclear specialists, which Sellafield Ltd has been calling on since April 2016 to carry out vital decommissioning work.

So far 34% of the partnership's spend has been with SMEs, much greater than the 20% committed by the lot delivery partners at the outset.

### We watched lessons start at new £30m education campus

The doors opened on our largest ever community investment – Campus Whitehaven.

The £30m education complex, welcomed its first students in January.

The site is home to state-of-the-art new buildings for St Benedict's secondary school and Mayfield special educational needs school.

We invested an original £10m to get the project off the ground. That attracted

an additional £20m in funding from other sources.

Funding for the project came from a range of partners including the Nuclear Decommissioning Authority, Copeland Community Fund, and Cumbria County Council.

The site includes new community sports provision, as well as a range of facilities for children with special educational needs including a hydrotherapy pool, a life skills flat, sensory rooms, and an immersive room.

### We launched a programme to tackle bullying and harassment

In our last Equality, Diversity and Inclusion survey, 1 in 4 people told us that they thought bullying was tolerated at Sellafield Ltd. A similar number thought harassment was tolerated.

A staggering 1 in 20 told us that they were being bullied or harassed at work.

This is clearly unacceptable, and so we have started to address it.

In January 2019 we launched an anti-bullying and harassment campaign aimed at drawing a line under this behaviour in our business by asking employees to call out inappropriate behaviour. We produced a video to explain more about the problem and why we're committed to addressing it and produced a toolkit for people to use if their felt they were being bullied or harassed or for people to use to help their colleagues and team mates.

*We launched  
a campaign to  
tackle bullying  
and harassment.*







## Quarter 4 | January-March 2019 *continued*

### We started to demolish the scene of Britain's worst nuclear accident

The first blocks of concrete were removed from the top of one of the world's most recognisable chimneys, marking the start of the demolition of Sellafield's Windscale Pile One stack.

Workers are cutting out 6-tonne 'chunks' of concrete using diamond wire saws.

**i** For more on our progress in cleaning up the Windscale Pile One Chimney, see our case study on page 44.

### We got Sellafield's 'locked vault' ready to be emptied

Machinery to remove waste from one of Europe's most hazardous nuclear buildings is now in place.

Engineering teams have installed equipment to scoop up and remove material from Sellafield's Pile Fuel Cladding Silo.

Safely decommissioning the 70-year-old facility is one of the highest priorities for us and the Nuclear Decommissioning Authority.

The building was originally designed to be permanently sealed, meaning innovative ways of accessing and

removing its inventory have had to be developed.

The retrievals equipment is contained in nine huge modules.

It has been lifted into place on top of a modern 'superstructure' built on the side of the building.

Waste retrieval trials are expected to begin later this year, moving into larger scale waste removal in 2020.

The work is being carried out in collaboration with Bechtel Cavendish Nuclear Solutions, a US-UK joint venture we appointed to help design, manufacture, test and install the machinery needed to empty the silo.

The equipment has been trialled at Rosyth, Scotland at a mock-up model of the silo. It took 18 months to design and 18 months to manufacture, test and commission – an incredibly tight timescale for a nuclear process.

**i** For more on our progress in cleaning up the Pile Fuel Cladding Silo, see our case study on page 24.

### We selected our preferred bidders for project partnership

Four organisations have been chosen as preferred bidders for a 20-year

partnership set to revolutionise project delivery at Sellafield.

The Programme and Project Partners model will establish long-term relationships to deliver the site's decommissioning programme.

Sellafield is home to one of the most complex portfolios of construction projects in the world, stretching over many decades.

The new approach will support the transformation of the company from a nuclear operator into a world leader in environmental remediation.

It is designed to support faster, more effective project delivery, stability in design and construction supply chains, greater workforce flexibility, and local economic benefit.

The partnership is made up of four lots.

Preferred bidders are:

- Integration: *Kellogg Brown and Root Ltd.*
- Design and Engineering: *Wood Nuclear Limited.*
- Civils Construction Management: *Morgan Sindall Construction and Infrastructure Ltd.*
- Process Construction Management: *Doosan Babcock Ltd.*



*Machinery to remove waste from the Pile Fuel Cladding Silo is now in place*

### **We unveiled a new plant to support clean-up**

A brand new plant is ready to help empty Sellafield's most hazardous nuclear waste stores.

The Silo Maintenance Facility will house and maintain the machinery that will get the waste out of two of the oldest plants on the site.

It has taken nine years to build and is described as the site's 'Formula One pit lane', a place where the machinery doing the most important job in UK nuclear decommissioning can be maintained in a safe, secure environment.

The project cost £250 million and is a collaboration between us, Balfour Beatty and Cavendish Nuclear, working together to deliver design, construct, install and test of the facility.

To mark their impressive safety record, the team donated £8,000 to eight local charities, chosen by those who have worked on the project.

**i** For more on the Silo Maintenance Facility, see our case study on page 40.

### **We helped West Cumbria make the shortlist in bid to help expand Heathrow Airport**

The former Alcan site at Lillyhall is one of 18 to make the shortlist, to host one of four logistics hubs to support the growth of the UK's busiest airport.

We submitted the bid on behalf of the county, putting forward for the site to be used as a base for manufacturing and construction related activities for the project.

Heathrow bosses will eventually pick four regional centres from the short list of 18, whittled down from an initial 121 applications.

The winners will be announced early next year, ahead of work starting in 2021.

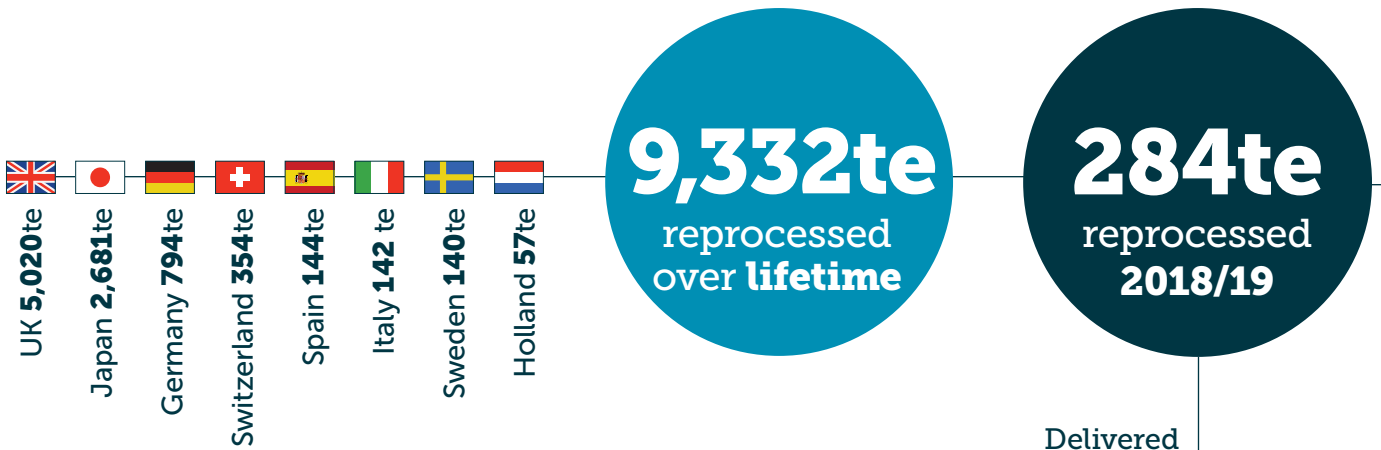
The hubs will pre-assemble components of the expanded airport before transporting them in consolidated loads to Heathrow. The aim is to ensure UK regions outside the south east benefit from the Heathrow expansion programme.

### **We said goodbye to the Sellafield Visitors Centre**

Built and opened to help remove some of the secrecy that surrounded the nuclear industry, the Sellafield Visitors Centre welcomed more than two million visitors through its doors before it closed in 2012.

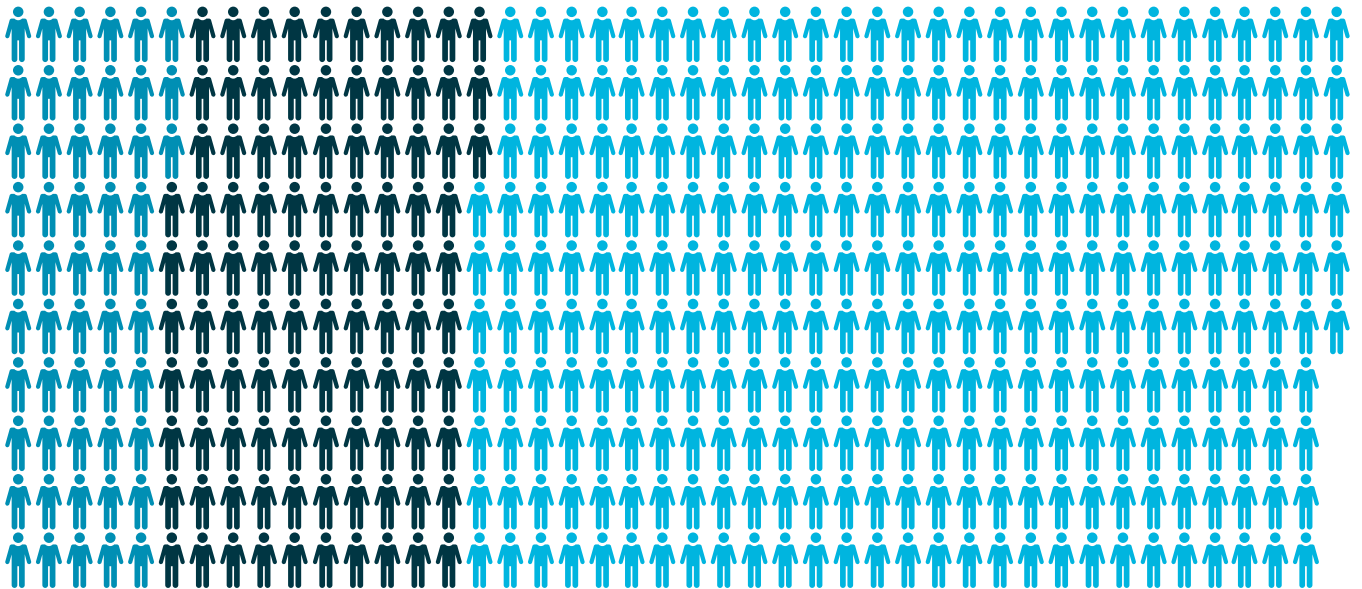
The former centre has now been demolished but there are many ways to stay up-to-date on what is happening at Sellafield. You can visit our website, follow our social media channels, visit our exhibition in the Beacon Museum, Whitehaven, and attend public West Cumbria Sites Stakeholder Group meetings.



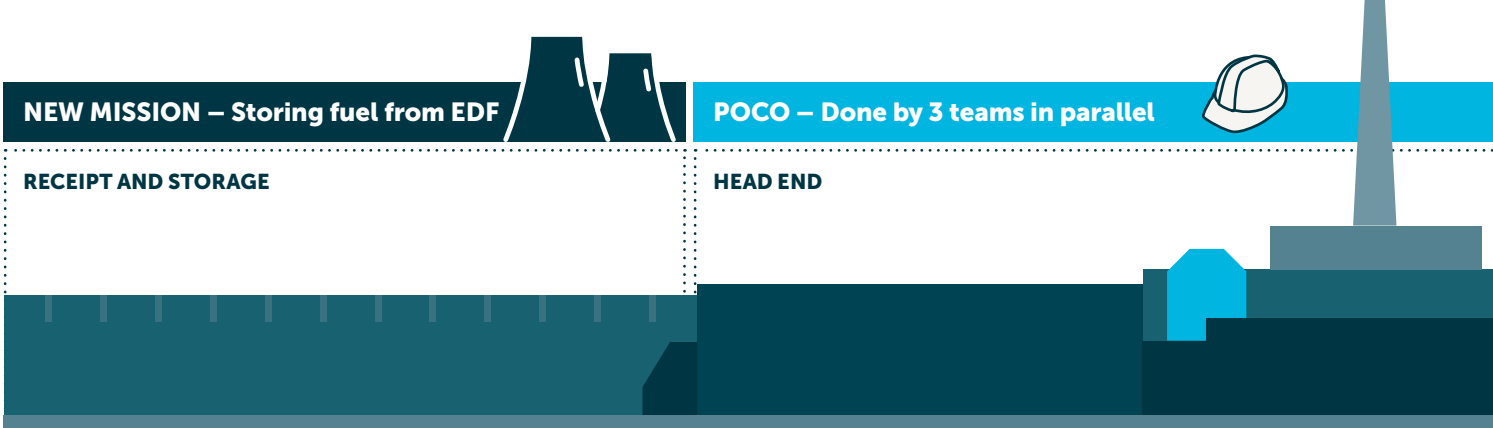


Delivered by:

**436**  
PEOPLE



**53** REDEPLOYED  
**100** REDEPLOYED BY MID 2019  
**283\*** POCO



Last shear:



# Completing Thorp Reprocessing



## *A new chapter at Sellafield has begun*

Since the Thermal Oxide Reprocessing Plant (Thorp) began operating a quarter of a century ago, it has brought in more than £9 billion to the UK from around the world by reprocessing more than 9,300 tonnes of fuel.

The plant was designed to operate for 25 years and has now reached the end of its design life. The closure of Thorp will reduce our authorised discharges and eventually reduce the hazard posed by the Sellafield site.

Shearing the final batch of fuel in Thorp in November 2018 was not a signal for the team to turn the lights out and lock the door behind them.

Parts of the highly engineered building, such as the medium active evaporator, will continue to support other work at Sellafield.

At the same time we will use the receipt and storage area to store used fuel for EDF Energy, helping them to keep their nuclear power stations running and lights on across the UK.

The fuel will be stored in the receipt and storage pond and there is still work to do in that area to receive the fuel. This work will continue until around 2030.

The decommissioning of Thorp will take us until around 2075 to finish. This will be different work, different challenges, with different skills required.

Through a programme of retraining and reskilling, we have redeployed people to new jobs at Sellafield, meaning that there were no redundancies as a result of this significant change to our mission.

### What is POCO?

In simple terms, Post Operational Clean Out gets a nuclear plant as radiologically clean as it can be. This reduces the risk and hazard posed by the plant and makes it cheaper to care for.

**2022**

*Estimated completion*

\* IN 2022 ALL 283 PEOPLE WILL BE REDEPLOYED



### CHEMICAL SEPARATION



**£4bn**

*Estimated total lifetime cost of cleaning up and fully demolishing Thorp*



# The Silo Maintenance Facility

The Silo Maintenance Facility is crucial to the decommissioning of our highest hazards on the Sellafield site.

It will maintain and store all the tools and equipment that we need to retrieve waste that has been locked inside the Magnox Swarf Storage Silo for seventy years.

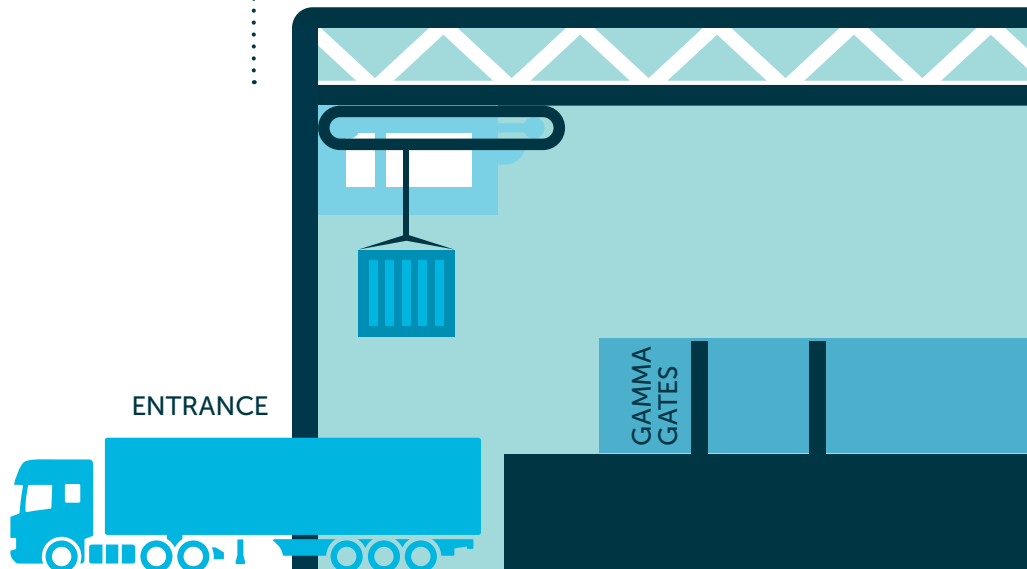
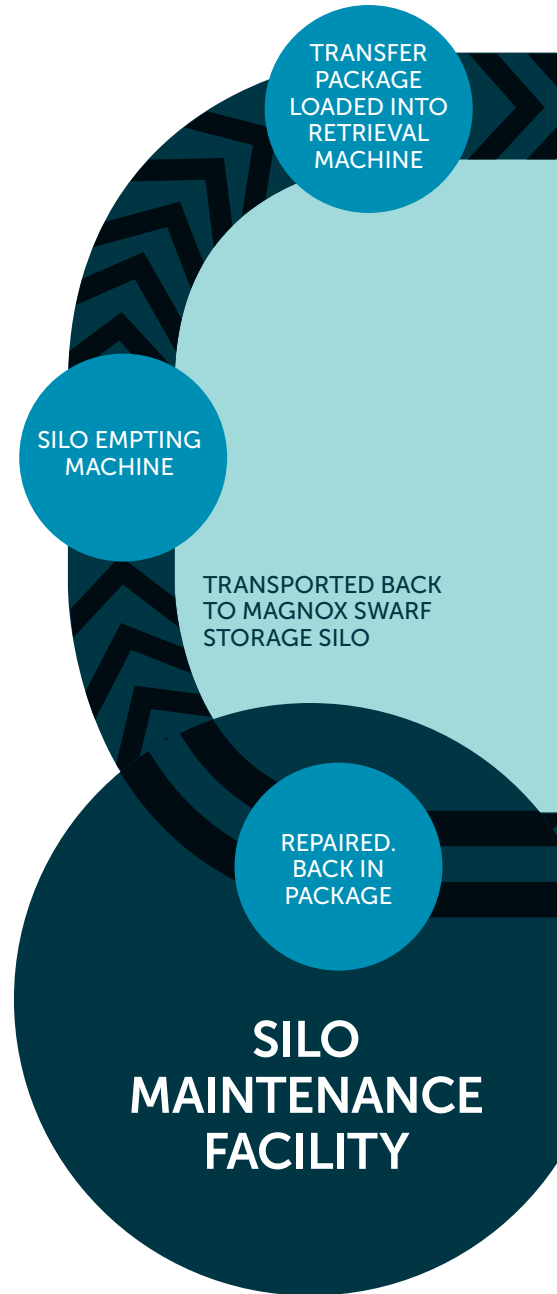
In the same way that Formula 1 cars pull into a pit lane for repairs and maintenance to ensure they finish the race, the Silo Maintenance Facility will ensure the teams are able to complete retrievals.

The facility has the capability to store, decontaminate, maintain, and change over the waste retrievals equipment and waste transfer flasks.

The operations team took control of the new facility in March 2019 and are now working through a phase of pseudo operations. During this period the facility will develop its methods of operation and train the operations and maintenance teams.

Following that, they'll start to bring into action the facility's operational procedures. This work is also essential to provide evidence to the Office for Nuclear Regulation that the plant can be safely operated when we ask them to give us permission to start the facility in 2019/20.

Routine maintenance of the facility and the other Magnox Swarf Storage Silo support equipment will also be carried out to ensure it is ready to support the start of retrievals as required.



# Magnox Swarf Storage Silo

RETRIEVAL MACHINE FILLS 3m<sup>3</sup> BOX WITH WASTE

3m<sup>3</sup> BOX INTO TRANSFER PACKAGE

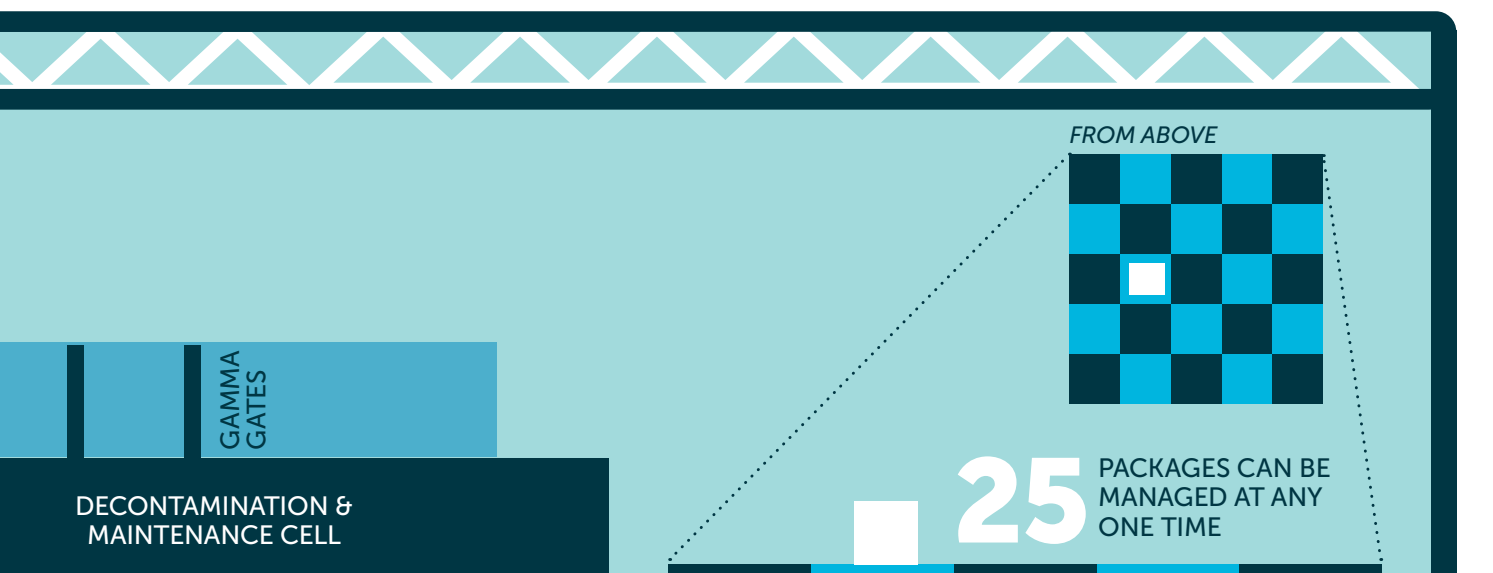
RETRIEVAL MACHINE EQUIPMENT FAILURE

3m<sup>3</sup> BOX SENT FOR STORAGE

**BOX ENCAPSULATION PLANT AND PRODUCT STORE/DIRECT IMPORT/EXPORT FACILITY**

SENT TO SILO MAINTENANCE FACILITY

EQUIPMENT INTO PACKAGE





# Repurposing our waste encapsulation plants

**CASE STUDY**

Our Waste Encapsulation Plants were built to deal with the intermediate level nuclear wastes that come from spent nuclear fuel reprocessing.

As reprocessing operations come to an end and our focus moves to high hazard risk reduction at Sellafield, our teams in the waste plants have been looking at how they could support the clean-up of the site.

That clean-up work includes retrieving nuclear waste from our legacy storage facilities, processing it and putting it into modern safe storage.

Our original plan was to build new processing facilities, but the waste encapsulation teams demonstrated that with some minor modifications to the existing waste encapsulation plants, they could process the waste for storage.

These modifications include physical changes to the plants, the development of the team so that they can safely carry out the new work, and increasing mobility, with the teams working across the various waste plants, so that they can work more effectively and efficiently.

The transformation of these buildings means that we have saved money for the UK tax payer by avoiding the need for new facilities and means that we can start the retrievals work sooner.

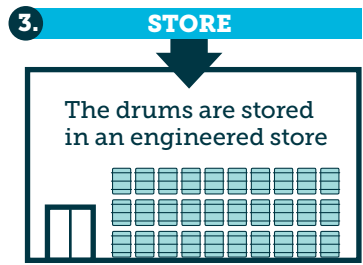
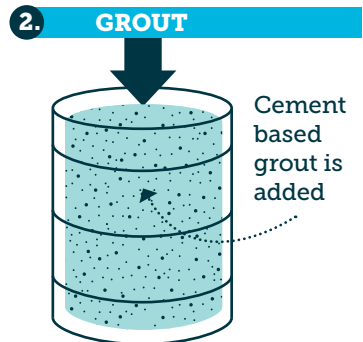
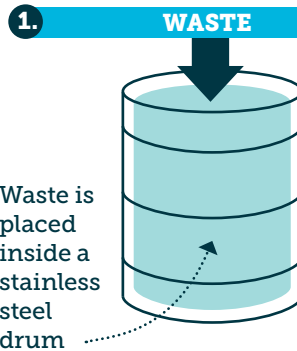
It also means that the team have secured lifetime extensions for the plants until 2040.

## Magnox Encapsulation plant

Built to encapsulate intermediate level waste from Magnox Reprocessing

**18,** ● ● ● Drums filled so far in its lifetime

### HOW DOES IT WORK?



**NEW MISSION**

**CONSOLIDATION**

Dragon Waste from Harwell will be encapsulated in the plant

**IMPROVEMENTS TO ENABLE NEW MISSION**

- < New lifting and handling equipment
- Control system and procedures updated >

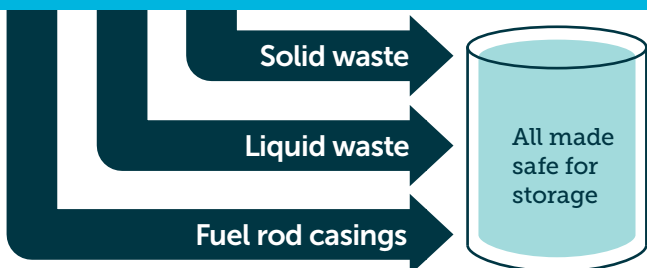
### WHAT'S NEXT?

The plant will be modified to receive and encapsulate solid waste from broad front decommissioning

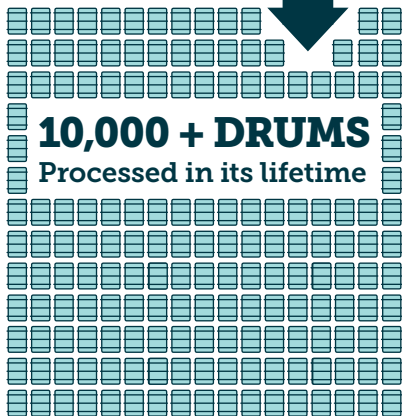
## Waste Encapsulation Plant

Built to encapsulate solid and liquid waste from Thorp Reprocessing

### 3 Waste streams



**2018**  
THE LAST  
SHEAR IN  
THORP



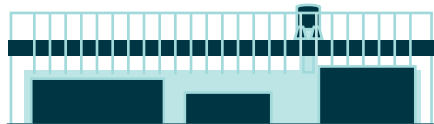
But we're not closing the door on the encapsulation plant

#### The Team has:

- ✓ Installed new lifting equipment
- ✓ Modified its control systems
- ✓ Modified its procedures...

...to take on **NEW MISSIONS**

They now encapsulate waste and sludge from: **Pile Fuel Storage Pond**



From **2025 for 10 YRS**

**WHAT'S NEXT?**



They'll receive sludge from: **First Generation Magnox Storage Pond**

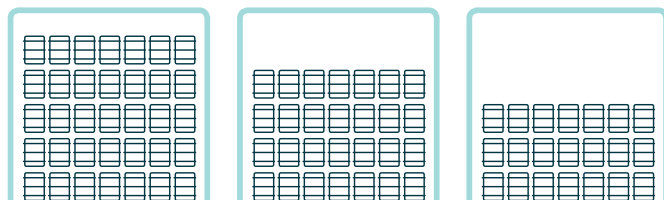
## Encapsulation Plants Stores Waste Treatment Route

Built to receive waste from the fuel handling plant

### 3 Waste streams

The waste created by reprocessing fuel from EDF Energy nuclear power stations is stored in single drums

**37,000+ DRUMS**



STORED IN **3 STORES** WITH ROOM FOR A FURTHER

**20,000**

### ACCELERATING RISK REDUCTION

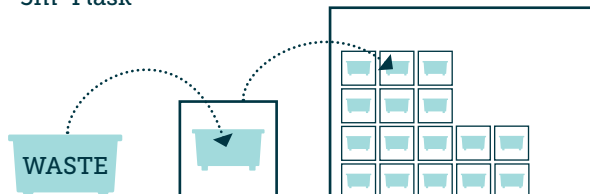
**NEW MISSION**

So we're modifying the building to receive and process waste from the **MAGNOX SWARF STORAGE SILOS**

#### Magnox Swarf Storage Silo

**1**  
A skip full of waste is placed inside a 3m<sup>3</sup> Flask

**2**  
3m<sup>3</sup> Flask is then stored safely in the Encapsulation Product Stores



**CASE STUDY**

1947

Construction started on two nuclear reactors, two ventilation stacks, a reprocessing plant and waste stores. The reactors produced plutonium for the country's atomic defence programme.

1950

Windscale Pile Reactor 1 went critical. Eight months later, the second reactor came on line.

# Changing the Sellafield skyline

Along with the golf ball (or Windscale Advanced Gas-cooled Reactor) and the Calder Hall cooling towers, the two Windscale pile chimneys make up an iconic image many people have of the Sellafield site.

These facilities are the legacy of a national defence programme and the atomic age of power generation.

The decommissioning of these reflects the future of Sellafield Ltd; a company focused on cleaning up Sellafield and safely managing the wastes this creates.

Work to demolish the remaining Windscale Pile Chimney is the perfect demonstration of this changing role.

## The importance of the chimney

The first Pile Chimney was demolished in 2001. However, the remaining chimney was a key defence against the effects of the 1957 fire.

Famously, the bulky filtration system was a last-minute addition, placed unusually at its summit.

When fire broke out in the Windscale Pile One reactor, the sky-high filters captured an estimated 95 per cent of the radioactive dust created.

## Demolition

As a result, demolition of this chimney is a much more complex task. Work also stopped for a number of years following to the sad death of a construction worker when removing steel work

from inside the chimney in 2003. Demolition work recommenced with the removal of the filter galleries. Since that, we've been planning the next stages of work, to remove the diffuser and then ultimately the barrel.

Much of this centred on developing a safe plan for the installation of a huge tower crane next to the chimney. This was completed in August 2018, which allowed demolition work to commence in December.

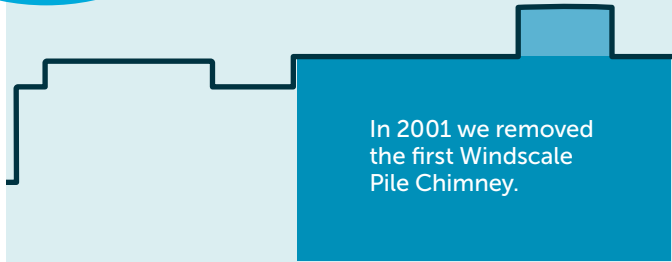
Workers access the chimney from a scaffolding gantry and use a diamond cutting machine to cut the huge sections of concrete, some steel-lined, into 6-tonne blocks. We use the crane to move the blocks to the ground for onward disposal. Depending on levels of contamination, blocks are either sent to the low level waste repository or are disposed of on the Sellafield site.

Recognising the specialist skills required to deliver demolition at height, the project is a collaboration between Sellafield teams and those from ADAPT – a member of our Decommissioning Delivery Partnership.

**How are we cleaning up the UK's worst nuclear accident?**

## How we're doing it

**Twin Chimney**



### 1 Install the tower crane

- Following the removal of the filter galleries the next stage of the demolition project is the removal of the diffuser at the top of the chimney.
- We spent a long time working to make sure we found a suitable solution that we could deliver safely.
- This led us to the decision to install the first ever tower crane on the Sellafield site. At a height of **152 metres**, it's almost as tall as Blackpool Tower.



### 2 Cutting

- We use diamond cutting machines to cut the diffuser into huge **6-tonne** chunks of concrete.
- The time it takes to cut each block is based on the thickness of the concrete and the amount of steel embedded within it.



1952

The First Generation Reprocessing Plant produced the first billet of metallic plutonium for the atomic bomb.

1957

Both Windscale reactors closed following a fire in Windscale Reactor 1. Both the reactor and chimney were damaged in the fire.

2001

The chimney attached to Windscale Reactor 2 was demolished.

2013

Demolition of the damaged Windscale Pile Chimney moved forward with the removal of the filter gallery, a 530-tonne structure of steel, brick and concrete.

Windscale Pile Chimney

### The facts

**60**  
people are delivering the demolition project.

**152m**  
tall tower crane

Complete by the end of **2021**

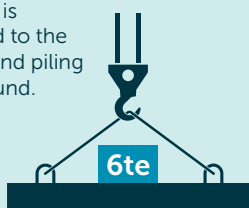
**125m**  
high stack

**6,000**  
tonnes of concrete will be removed from the top of the chimney

The tower crane driver sits in the cabin, **125 metres above the ground**. They access the cabin via a lift.

### 3 Move the blocks to the ground

- We then use the tower crane to safely move the blocks to the ground.
- The crane is connected to the chimney and piling in the ground.



### 4 Waste disposal

- Based on the levels of contamination found in the blocks, they are either sent to the low level waste repository or to a landfill site elsewhere on the Sellafield site.
- We use a second crane to help move the huge blocks at ground level.



### What's next?

The current project will remove the diffuser from the top of the chimney. This will leave the chimney barrel standing.

We are currently considering whether we should continue to remove the barrel, using the same team and while the tower crane is in place.

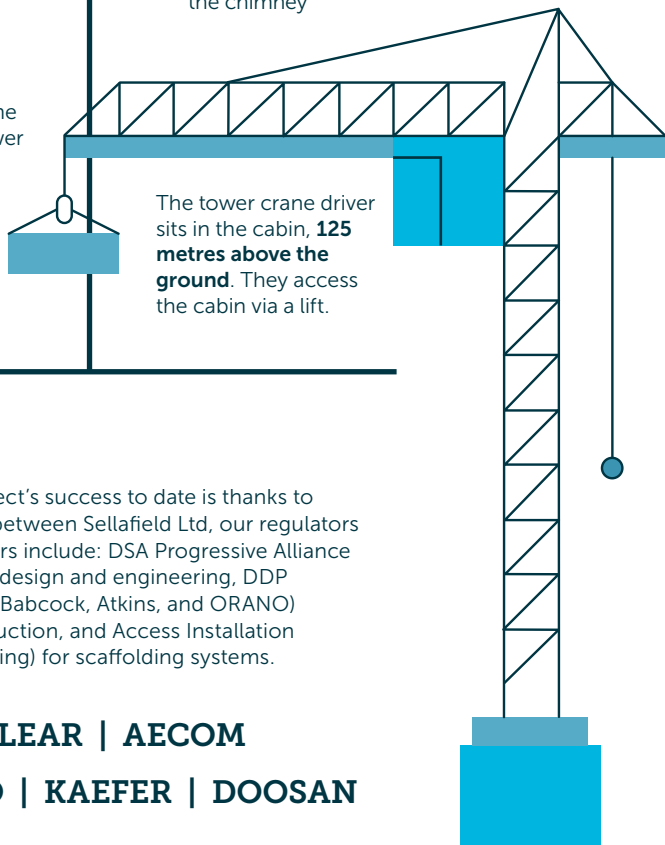
While there are economic advantages to doing this, removing the barrel isn't as much of a priority as other decommissioning work.

### A team effort

A significant part of the project's success to date is thanks to the collaborative approach between Sellafield Ltd, our regulators and the supply chain. Partners include: DSA Progressive Alliance (Cavendish and AECOM) for design and engineering, DDP Framework ADAPT (Doosan Babcock, Atkins, and ORANO) for procurement and construction, and Access Installation Framework (Kaefer Engineering) for scaffolding systems.

CAVENDISH NUCLEAR | AECOM

ATKINS | ORANO | KAEFER | DOOSAN







# Travel and access changes

In recent years, few issues have provoked more discussion than travel and access to the Sellafield site.

In fact, the journey to and from work is one of the most visible demonstrations of our presence to those who live nearby.

As our mission changes and we focus on the clean-up of Sellafield, we will need new facilities to treat and store waste. All of these will take more of the limited space we have within the site fence.

So, we have to make sure we're using available land in the best way. To help, we've been demolishing facilities we no longer use, and are identifying areas for development.

One consequence of this is a reduction of car parking spaces. This reduction put pressure on the remaining spaces and led to safety concerns around parking behaviours.

Knowing that spaces would only reduce further, it was clear we had to take action and reduce the number of vehicles accessing the site. We also hoped that any changes would lead to other benefits including reducing traffic on local roads.

Prior to restricting access, we introduced commuter buses, park and rides and a car sharing system, to give people more choices for how to get to work.

In July 2018, once these systems were working, we introduced new site access arrangements. These meant you would need 3 people in a vehicle to access the Sellafield site, and 2 for the near site car parks.

While the changes have taken some getting used to, people have responded positively, vehicle numbers have reduced and traffic has improved.

In order to increase much needed space on the Sellafield site, we introduced:



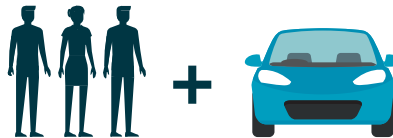
COMMUTER BUSES



CAR SHARING

In July 2018, we introduced new site access arrangements:

Sellafield site



3 people in a car to access the Sellafield site

Car parks near site



2 people in a car to access the car parks near to site

This means:



Purchasing car parking spaces provided revenue to local councils in West Cumbria



A reduction in the number of vehicles coming to site each day by a third

### Commuter services to Sellafield run from:

1 Wigton

2 Cockermouth

3 Workington

4 Frizington

5 Whitehaven

6 Cleator Moor

7 Egremont

Sellafield

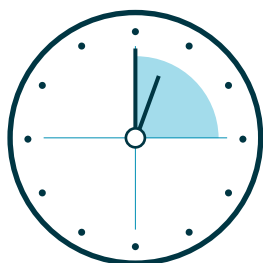
8 Seascale

9 Gosforth

10 Millom

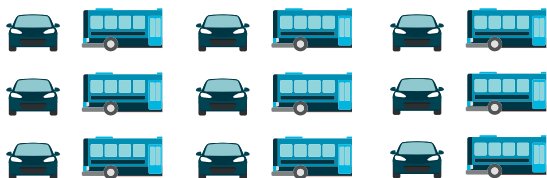


PARK AND RIDE



### Every 15 minutes

shuttle bus service between Sellafield and our Whitehaven offices



# 9

park and ride locations



On site car parking spaces reduced by 1,000



# 750,000

individual bus journeys this financial year

Daily bus services:  
Warrington > Sellafield  
Sellafield > Warrington

Warrington

