

Mission Progress Report

Published July 2019

Introduction

THE MISSION

Our mission is to clean up the UK's earliest nuclear sites safely, securely and cost-effectively with care for people and the environment.

THE MISSION PROGRESS REPORT

This year we have introduced a new approach to reporting progress against that mission.

We have focused on the 4 themes we outlined in our strategy that are common across all sites and enable us to measure our achievements. Whether it's managing the spent fuels from Magnox reactors, safely transferring and storing nuclear materials in more modern facilities or treating and packaging various types of radioactive waste, it's all leading us to the ultimate goal of being able to hand back the land we currently own, making it available to communities for other uses.

Working with our businesses and key stakeholders, we generated this report that demonstrates how far we have travelled since 2005, and how much further is left to go over the next 120-plus years.

We've determined what each of the key steps or 'strategic outcomes' are that we need to achieve in order to complete our mission. We've applied a consistent set of measurements or 'metrics' for the data that shows what materials and buildings we have to manage and, crucially, we indicate what is happening now and what important decisions need to take place in order for us to complete our mission.

HOW TO READ THIS REPORT

This report is structured to illustrate the progress against the strategic objectives outlined in our strategy.

In the first 3 pages you'll see a very high level summary of what the mission is and how far we have progressed since 2005. Each of the 4 themes has an overview page to explain our objectives and the steps we need to take. Each step (or 'strategic outcome') shows the estimated inventory that has to be managed and what capability there is to deliver it.

A strategic outcome may have a priority placed on it by stakeholders subject to the nature of its hazards or risks.

The figures contained within this report, are correct up to 31 March 2019 from key data sources and programmes. As data matures, along with the reduction of uncertainty of the inventory and the progression in the lifecycle, it will be subject to change. Excluded from this report are critical enablers, liquid and gaseous discharges, non NDA liabilities and non radioactive waste at this time.

TELLING THE STORY OF PROGRESS AGAINST OUR STRATEGY

NDA STRATEGY

Purpose: Energy Act requirement that describes how we will deliver our mission

Period covered: 100+ years
Published: every 5 years
Public consultation: 12 weeks

NDA BUSINESS PLAN

Purpose: Energy Act requirement that describes what the main activities will be across our estate over the next 3 years and what funding will be available for them. Provides a 20 year picture of programme outcomes.

Period covered: 3 years (1 year in detail)
Published: every year
Public consultation: 8-10 weeks

MID-YEAR PERFORMANCE REPORT

Purpose: To provide a progress update against Business Plan targets. Incorporates NDA group targets.

Period covered: 6 months
Published: every year

NDA MISSION PROGRESS

Purpose: To provide our stakeholders with a clear, concise and simple story of NDA Mission Progress since 2005, that demonstrates delivery of NDA's 4 strategic themes and outcomes as explained in NDA Strategy 2016.

Period covered: 100+ years
Published: every 5 years

STRATEGIC THEMES



ANNUAL REPORT AND ACCOUNTS

Purpose: Energy Act requirement that describes what has been achieved and what has been spent. Reports against Business Plan targets and gives updates on Priority Programmes and Major Projects. It will also contain an overall progress update against our mission.

Period covered: 1 year
Published: every year

Delivering our mission

For the purposes of this report, we break the mission down into 4 strategic themes enabling work to be clearly defined and prioritised.

These areas are closely linked. However, the most urgent task is dealing with sites' highest hazard materials: spent fuel, nuclear materials and highly radioactive wastes. Once the inventory has been made safe, the redundant nuclear facilities can be dismantled and demolished.

SPENT FUELS

Our strategy defines our approach to managing the diverse range of spent fuels for which we are responsible, which are divided into Magnox, Oxide and Exotic.



NUCLEAR MATERIALS

Our strategy defines our approach to dealing with the inventory of uranium and plutonium currently stored on some of our sites.



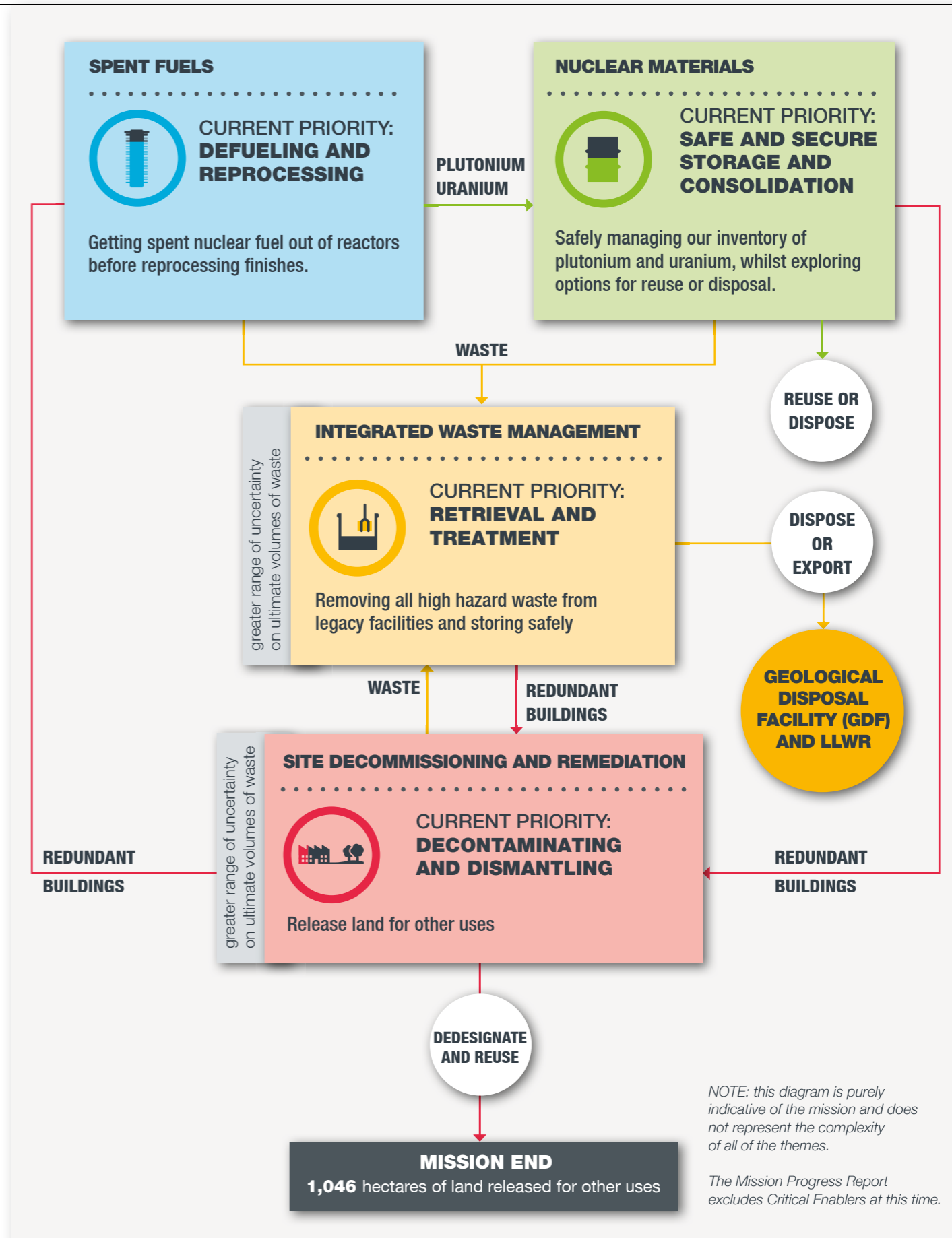
INTEGRATED WASTE MANAGEMENT

Our strategy considers how we manage all forms of waste arising from operating and decommissioning our sites, including waste retrieved from legacy facilities.



SITE DECOMMISSIONING & REMEDIATION

Our strategy defines our approach to decommissioning redundant facilities and managing land quality in order that each site can be released for its next planned use.





Spent Fuels

OBJECTIVE

To ensure safe, secure and cost-effective lifecycle management of spent fuels - Strategy 2016, p40

WHAT ARE SPENT FUELS?

Fuel from a nuclear reactor is 'spent' once it has been used to generate electricity.

HOW ARE THE FUELS MANAGED?

Spent fuels are transported to Sellafield for management. Some spent fuels are reprocessed into uranium and plutonium, potentially for re-use, leaving some residual waste. Once reprocessing ends completely in 2020, remaining spent fuel will be stored for future disposal.

WHAT HAS HAPPENED SINCE 2005?

The Magnox reactors are now nearly defueled with only Wylfa and Calder Hall left to complete and most fuel has been reprocessed. Sellafield continues to receive AGR fuel under commercial contracts with EDF Energy, some of which has already been reprocessed, the rest will be placed in interim storage. No more fuel will be reprocessed now, with the last fuel sent to THORP in 2018.

WHAT HAS TO HAPPEN NEXT?

Sellafield's last reprocessing facility will end operations in 2020. All remaining spent fuel will be safely stored until a permanent solution for disposal is developed.



Spent Magnox Fuel	
Opening stock	2,770 te
Defueling	4,140 te
Legacy	500 te
Total	7,410 te

Spent Oxide Fuel	
Opening stock	3,150 te
Receiving	6,220 te
Total	9,370 te

Spent Exotics Fuel	
Opening stock	179 te
Defueling	44 te
Total	223 te

PROGRESS

95% ¹

THE NEXT 4 STRATEGIC OUTCOMES TO BE ACHIEVED

ALL SITES DEFUELED OF MAGNOX FUEL

88% ³

ALL MAGNOX FUEL REPROCESSING COMPLETED

79% ¹³

ALL EXOTIC FUEL REPROCESSING COMPLETED

43% ¹¹

ALL EXOTIC FUEL DEFUELED

STRATEGIC OUTCOMES - final steps to achieving our mission

	SPENT MAGNOX FUEL	Est. date of completion	Priorities	MISSION END
1	ALL SITES DEFUELED	2020	GROUP PRIORITY	REUSE/DISPOSAL
2	ALL LEGACY FUEL RETRIEVED	2025	ONR PRIORITY ^Δ	
3	MAGNOX FUEL REPROCESSING COMPLETED	2020	GROUP PRIORITY	
4	ALL REMAINING MAGNOX FUEL IN INTERIM STORAGE	2025		
5	ALL REMAINING MAGNOX FUEL DISPOSED	2125		
SPENT OXIDE FUEL				
6	ALL EDFE OXIDE FUEL RECEIVED	2035	GROUP PRIORITY	REUSE/DISPOSAL
7	ALL LEGACY FUEL RETRIEVED	2016	COMPLETED	
8	ALL OXIDE FUEL REPROCESSING COMPLETED	2019	COMPLETED	
9	ALL REMAINING OXIDE FUEL IN INTERIM STORAGE	2035		REUSE/DISPOSAL
10	ALL REMAINING OXIDE FUEL DISPOSED	2125		
SPENT EXOTICS FUEL				
11	ALL EXOTIC FUEL DEFUELED	2022	GROUP PRIORITY	REUSE/DISPOSAL
12	ALL EXOTIC FUEL CONSOLIDATED*	2028	GROUP PRIORITY	
13	ALL EXOTIC FUEL REPROCESSING COMPLETED	2020	GROUP PRIORITY	
14	ALL REMAINING EXOTIC FUEL IN INTERIM STORAGE	2028		
15	ALL REMAINING EXOTIC FUEL DISPOSED	2125		

*irradiated fuel only

^Δ Office for Nuclear Regulation (ONR)



Spent Fuels

Magnox and Oxide

To ensure safe, secure and cost-effective lifecycle management of spent fuels.
Strategy 2016, p40

Spent Magnox Fuel	
Opening stock	2,770 te
Defueling	4,140 te
Legacy	500 te
Total	7,410 te

Spent Oxide Fuel	
Opening stock	3,150 te
Receiving	6,220 te
Total	9,370 te

SPENT MAGNOX FUEL - To ensure the safe management and disposition of spent Magnox fuel, completing Magnox reprocessing as soon as practicable. *Strategy 2016, p42*

Opening stock 2005

In 2019, work continues to defuel the remaining Magnox reactors, retrieve high hazard fuel from at Sellafield, complete reprocessing and safely store the spent fuel on an interim basis.

STRATEGIC DECISIONS

Outputs

2,770te

(840te at Sellafield, plus 1,930t arising from power generation)

Inventory

Capability

Strategic Outcomes

Defueling

RISK REDUCTION STEP 1 (tonnes) **GROUP PRIORITY**

3,920 defueled	220 still to defuel	4,140 total
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95% COMPLETE

24 out of 26 reactors on 11 sites have been defueled.

1 ALL SITES DEFUELED BY 2020

All 11 UK Magnox power stations are closed. Out of 26 reactors, only 2 still contain fuel: one at Calder Hall and one at Wylfa. These are in the process of despatching their spent fuel to Sellafield.

Legacy fuel retrieval

RISK REDUCTION STEP 2 (tonnes) **ONR PRIORITY**

130 retrieved	370 still to retrieve	500 total
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26% COMPLETE

First Generation Magnox Storage Pond (FGMSP) - Sellafield

2 ALL LEGACY FUEL RETRIEVED BY 2025

Spent fuel arriving at Sellafield was originally stored in the First Generation Magnox Storage Pond (FGMSP) before transfer for reprocessing. FGMSP is one of the estate's most hazardous facilities.

Reprocessing

RISK REDUCTION STEP 3 (tonnes) **GROUP PRIORITY**

6,060 reprocessed	850 still to reprocess	6,910 total
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88% COMPLETE

Magnox reprocessing plants - Sellafield

3 ALL MAGNOX FUEL REPROCESSING COMPLETED IN 2020

The NDA aims to complete reprocessing of Magnox fuel as soon as possible, and to close the Magnox Reprocessing Plant by the end of 2020. It may not be practicable to reprocess all Magnox fuel and contingencies for interim storage of any remaining fuel are being developed.

Interim storage

RISK REDUCTION STEP 4 (tonnes)

130 current inventory	370 still to store	500 estimated total
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26% COMPLETE

Fuel Handling Plant (FHP) - Sellafield Interim Storage Facility - Sellafield

4 ALL REMAINING MAGNOX FUEL IN INTERIM STORAGE BY 2025

After reprocessing ends the fuel will be put into interim storage.

Reuse/Disposal

RISK REDUCTION STEP 5 (tonnes)

0 volume disposed	500 still to be disposed	500 estimated total
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0% COMPLETE

NO FACILITY CURRENTLY EXISTS Geological Disposal Facility (GDF) and Conditioning Plant

5 ALL REMAINING MAGNOX FUEL DISPOSED OF BY 2125

Remaining fuel will need to be conditioned prior to transferring to a final disposal solution. Strategic options are currently being developed for the final management of this fuel.



SPENT OXIDE FUEL - To ensure the safe management and disposition of UK-owned oxide and overseas-origin fuels held in the UK, and to complete THORP reprocessing as soon as practicable. *Strategy 2016, p44*

In 2019, we continue to receive fuel from EDF Energy sites. Reprocessing is now complete and we safely store the remaining spent fuel on an interim basis.

STRATEGIC DECISIONS

Outputs

Opening stock 2005

3,150te

Inventory

Capability

Strategic Outcomes

Receipts

- RISK REDUCTION STEP 1 (tonnes) **GROUP PRIORITY**

2,550 received	3,670 still to be received	6,220 total
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41% COMPLETE

THORP Receipt and Storage Pond - Sellafield

6 ALL EDF OXIDE FUEL RECEIVED BY 2035

The NDA is committed, through commercial contracts, to receiving and managing spent fuel (including 3,150 te opening stock) from EDF's 7 AGR power stations in England and Scotland. The last of these power stations is due to close around 2035, however, EDF has declared its intention to run them for as long as possible, providing it is safe and economic to continue. This provides a major source of income for the NDA.

Legacy fuel retrieval

- RISK REDUCTION STEP 2 (tonnes)

3 retrieved	0 still to retrieve	3 total
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100% COMPLETE

Pile Fuel Storage Pond - Sellafield

7 ALL LEGACY FUEL RETRIEVED IN 2016

Early spent oxide fuel was consigned to the Pile Fuel Storage Pond and has all been removed for storage in more modern facilities.

Reprocessing

- RISK REDUCTION STEP 3 (tonnes)

3,610 reprocessed	0 still to reprocess	3,610 total
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100% COMPLETE

THORP Reprocessing Plant - Sellafield

8 ALL OXIDE FUEL REPROCESSING COMPLETED IN 2019

The NDA, after studying options over a number of years, concluded in 2012 that THORP should close following completion of the current contracts. To ensure this remained the most viable and cost-effective option, the NDA has identified how to provide sufficient capacity at THORP to store all remaining fuel that is not reprocessed. This total includes the opening stock of 3,150 te.

Interim storage

- RISK REDUCTION STEP 4 (tonnes)

2,090 current inventory	3,670 still to store	5,760 estimated total
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36% COMPLETE

THORP Receipt and Storage Pond - Sellafield

9 ALL REMAINING OXIDE FUEL IN INTERIM STORAGE BY 2035

Sellafield's storage ponds contain approximately 2,090 te of spent oxide fuel. Following THORP's closure in 2018, it is expected that this fuel will be consolidated in the THORP Receipt and Storage Pond. Circa 3,670 te remaining from EDFs 7 AGR power stations will be received and transferred to the same facility by 2035. It will all be stored in the facility until a policy decision is made on the future management.

Reuse/Disposal

RISK REDUCTION STEP 5 (tonnes)

0 volume disposed	5,760 still to be disposed	5,760 estimated total
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0% COMPLETE

NO FACILITY CURRENTLY EXISTS Geological Disposal Facility (GDF) and Conditioning Plant

10 ALL REMAINING OXIDE FUEL DISPOSED OF BY 2125

Remaining fuel will need to be conditioned prior to transferring to a final disposal solution. Strategic options are currently being developed for the final management of this fuel.





Spent Fuels

To ensure safe, secure and cost-effective lifecycle management of spent fuels.
Strategy 2016, p40

Exotics

Spent Exotic Fuel	
Opening stock	179 te
Defueling	44 te
Total	223 te

SPENT EXOTIC FUEL

- To ensure all our exotic fuels are managed and ultimately disposed of, with options developed for those fuels which cannot be effectively managed through our routes for Magnox or oxide fuels. Strategy 2016, p48.

In 2019, work continues to defuel the Dounreay Fast Reactor, consolidate exotic fuel at Sellafield and complete reprocessing.

STRATEGIC DECISIONS

Outputs

Opening stock 2005

179te

Inventory

Capability

Strategic Outcomes

Defueling

RISK REDUCTION STEP 1 (tonnes)

19	25	44
defueled	still to defuel	total

43% COMPLETE

Capability: Dounreay Fast Reactor (DFR)

Strategic Outcome: ALL EXOTIC FUEL DEFUELED BY 2022

Consolidation (irradiated)

RISK REDUCTION STEP 2 (tonnes)

19	37	56
consolidated	still to consolidate	total

34% COMPLETE

Capability: Consolidate stocks at Sellafield

Strategic Outcome: ALL EXOTIC FUEL CONSOLIDATED BY 2028

Reprocessing

RISK REDUCTION STEP 3 (tonnes)

69	18	87
reprocessed	still to reprocess	total

79% COMPLETE

Capability: THORP and Magnox reprocessing plants - Sellafield

Strategic Outcome: ALL EXOTIC FUEL REPROCESSING COMPLETED BY 2020

Interim storage

RISK REDUCTION STEP 4 (tonnes)

117	19	136
current inventory	still to store	estimated total

86% COMPLETE

Capability: THORP Receipt and Storage Pond - Sellafield

Strategic Outcome: ALL REMAINING EXOTIC FUEL IN INTERIM STORAGE BY 2028

Reuse/Disposal

RISK REDUCTION STEP 5 (tonnes)

0	136	136
volume disposed	still to be disposed	estimated total

0% COMPLETE

Capability: NO FACILITY CURRENTLY EXISTS Geological Disposal Facility (GDF) and Conditioning Plant

Strategic Outcome: ALL REMAINING EXOTIC FUEL DISPOSED OF BY 2125



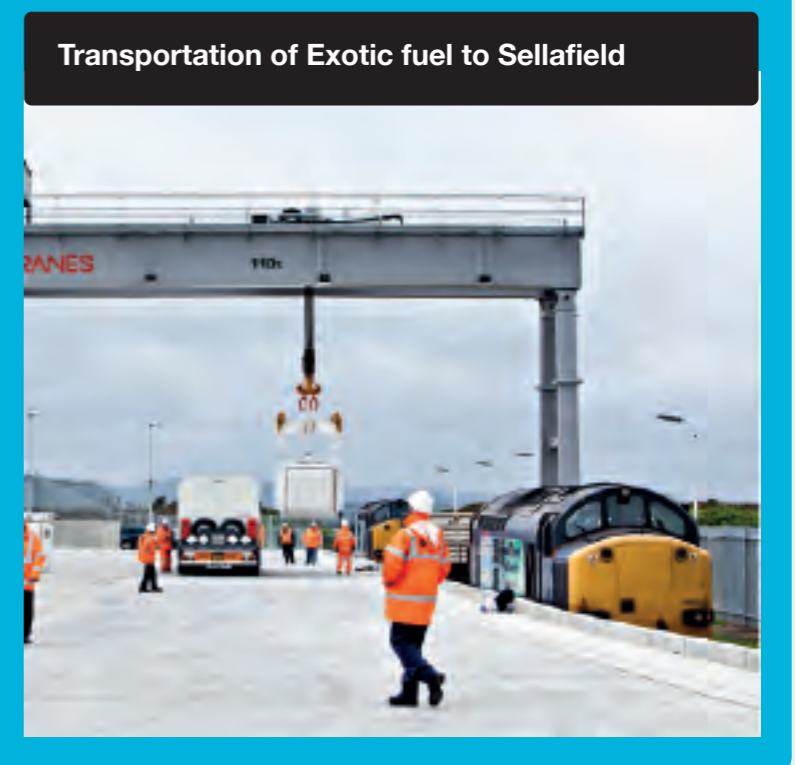
A number of very early experimental reactors tested novel kinds of fuel, producing spent fuel with distinctive characteristics. There is a much smaller quantity of these diverse, non-standard types compared to Oxide and Magnox and they are collectively known as Spent Exotic Fuels. Only one reactor still contains exotic fuel - the Dounreay Fast Reactor (DFR).

Spent Exotic fuel (irradiated) is being consolidated at Sellafield. A variety of Spent Exotic fuel was already at Sellafield in 2005 from earlier consolidation activities and historic overseas reprocessing contracts.

Until operations end, the Magnox Reprocessing Plant will treat DFR fuel moved to Sellafield. The majority of Spent Exotic fuel has already been reprocessed at Sellafield's THORP and Magnox plants.

A variety of exotic fuels will remain in interim storage at Sellafield when reprocessing operations cease. They will remain in storage whilst options for management of this fuel are developed.

Remaining fuel will need to be conditioned prior to transferring to a final disposal. Strategic options are currently being developed for the final management of this fuel.



Nuclear Materials

Plutonium		Uranics	
Opening inventory	102 te	Opening inventory	47,000 te
Produced	38 te	Produced	7,000 te
Total	140 te	Total	54,000 te

OBJECTIVE

To ensure safe, secure and cost-effective lifecycle management of nuclear materials. Strategy 2016, p50

WHAT ARE NUCLEAR MATERIALS?

The NDA owns an inventory of plutonium and uranium. Known collectively as 'nuclear materials', all are by-products from different phases of the fuel cycle, including the reprocessing of spent fuel.

HOW ARE THE MATERIALS MANAGED?

All nuclear materials are managed safely and securely under exacting standards set by the International Atomic Energy Agency (IAEA) regulations. The independent Office for Nuclear Regulation (ONR) is responsible for regulating nuclear safety and security across the UK and its inspectors ensure that site licensees meet stringent requirements.

WHAT HAS HAPPENED SINCE 2005?

Options are being developed for using plutonium in new fuels, and research is being carried out on technologies. The NDA has largely completed uranic material production and consolidation.

WHAT HAS TO HAPPEN NEXT?

All nuclear materials will be either converted into new fuel for nuclear reactors or immobilised and stored until a permanent UK disposal facility is developed. Consolidation is ongoing. Some hazardous uranics must be treated and repackaged for long-term storage, while Sellafield's plutonium inventory will be repackaged. The government will reach a decision on possible re-use or disposal following completion of the technical studies.



PROGRESS

THE NEXT 4 STRATEGIC OUTCOMES TO BE ACHIEVED

80%
ALL PLUTONIUM CONSOLIDATED

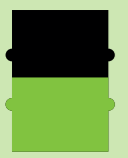
95%
ALL PLUTONIUM PRODUCED

86%
ALL URANIUM PRODUCED

86%
ALL URANIUM CONSOLIDATED

STRATEGIC OUTCOMES - final steps to achieving our mission

	PLUTONIUM	Est. date of completion	Priorities	MISSION END
1	ALL PLUTONIUM PRODUCED	2021	GROUP PRIORITY	REUSE/DISPOSAL
2	ALL PLUTONIUM CONSOLIDATED	2019	GROUP PRIORITY	
3	ALL PLUTONIUM REPACKED	2060	ONR PRIORITY	
4	ALL PLUTONIUM IN INTERIM STORAGE	2060		
5	ALL PLUTONIUM REUSED OR DISPOSED	2120		
<hr/>				
	URANICS			REUSE/DISPOSAL
6	ALL URANIUM PRODUCED	2021	GROUP PRIORITY	
7	ALL URANIUM CONSOLIDATED	2025	GROUP PRIORITY	
8	ALL URANIUM TREATED	2055	GROUP PRIORITY	
9	ALL URANIUM IN INTERIM STORAGE	2055		
10	ALL URANIUM REUSED OR DISPOSED	2120		



Nuclear Materials

To ensure safe, secure and cost-effective lifecycle management of our nuclear materials.
Strategy 2016, p50

Plutonium		Uranics	
Opening inventory	102 te	Opening inventory	47,000 te
Produced	38 te	Produced	7,000 te
Total	140 te	Total	54,000 te

PLUTONIUM - To ensure the safe and secure management of separated plutonium stocks held by the NDA and to work with the government to develop a long-term solution. Strategy 2016, p52

In 2019, work continues to complete reprocessing and consolidate plutonium at Sellafield.

STRATEGIC DECISION Outputs

Opening stock 2005	Quantities produced - RISK REDUCTION STEP 1 (tonnes)	Consolidation - RISK REDUCTION STEP 2 (tonnes)	Repacking - RISK REDUCTION STEP 3 (tonnes)	Interim storage - RISK REDUCTION STEP 4 (tonnes)	Reuse/Disposal - RISK REDUCTION STEP 5 (tonnes)																														
102te <small>Inventory</small>	<table border="0"> <tr> <td> 36</td> <td> 2</td> <td> 38</td> </tr> <tr> <td>quantity produced</td> <td>still to be produced</td> <td>total</td> </tr> </table> <p>95% COMPLETE</p>	36	2	38	quantity produced	still to be produced	total	<table border="0"> <tr> <td> 1.6</td> <td> 0.4</td> <td> 2</td> </tr> <tr> <td>consolidated</td> <td>still to consolidate</td> <td>total</td> </tr> </table> <p>80% COMPLETE</p>	1.6	0.4	2	consolidated	still to consolidate	total	<table border="0"> <tr> <td> 0</td> <td> 140</td> <td> 140</td> </tr> <tr> <td>repacked</td> <td>still to repack</td> <td>total</td> </tr> </table> <p>0% COMPLETE</p>	0	140	140	repacked	still to repack	total	<table border="0"> <tr> <td> 0</td> <td> 140</td> <td> 140</td> </tr> <tr> <td>current inventory</td> <td>still to be stored</td> <td>estimated total</td> </tr> </table> <p>0% COMPLETE</p>	0	140	140	current inventory	still to be stored	estimated total	<table border="0"> <tr> <td> 0</td> <td> 140</td> <td> 140</td> </tr> <tr> <td>reused or disposed</td> <td>still to be reused or disposed</td> <td>estimated total</td> </tr> </table> <p>0% COMPLETE</p>	0	140	140	reused or disposed	still to be reused or disposed	estimated total
36	2	38																																	
quantity produced	still to be produced	total																																	
1.6	0.4	2																																	
consolidated	still to consolidate	total																																	
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repacked	still to repack	total																																	
0	140	140																																	
current inventory	still to be stored	estimated total																																	
0	140	140																																	
reused or disposed	still to be reused or disposed	estimated total																																	
<small>Capability</small>	Magnox and THORP reprocessing - Sellafield	Consolidate inventory at Sellafield	NO FACILITY CURRENTLY EXISTS SPRS Re-treatment plant (SRP) currently in design phase - Sellafield	Product and Residue Stores - Sellafield	NO FACILITY CURRENTLY EXISTS Geological Disposal Facility (GDF)																														
<small>Strategic Outcomes</small>	ALL PLUTONIUM PRODUCED BY 2021	ALL PLUTONIUM CONSOLIDATED BY 2019	ALL PLUTONIUM REPACKED IN LONG TERM CONTAINERS BY 2060	ALL PLUTONIUM IN MODERN INTERIM STORAGE BY 2060	ALL PLUTONIUM REUSED OR DISPOSED OF BY 2120																														
	When the NDA was established, 102 tonnes of plutonium had already been produced from reprocessing.	The NDA took the decision to consolidate all plutonium in new storage at Sellafield. The plutonium inventory will however, need repacking into long-term storage containers.	A major capital project is currently in progress to provide the capability to repack plutonium in new containers. Packages will be prioritised for repacking. By 2030 the current highest risk packages will have been repacked.	Following repacking, all containers will be stored in the Sellafield Product and Residue Stores pending a decision on plutonium future management. New store capacity will be required to achieve the outcome.	Nuclear materials will need to be conditioned prior to transferring to a final disposal facility. Strategic options are currently being developed for the final management of this nuclear material.																														

Waste →

Redundant Buildings →

URANICS - To ensure management and disposition of our uranics inventory. Strategy 2016, p54

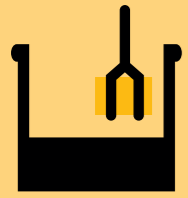
In 2019, work continues to complete reprocessing and consolidate uranics at Capenhurst.

STRATEGIC DECISION Outputs

Opening stock 2005	Quantities produced - RISK REDUCTION STEP 1 (tonnes)	Consolidation - RISK REDUCTION STEP 2 (tonnes)	Treatment - RISK REDUCTION STEP 3 (tonnes)	Interim storage - RISK REDUCTION STEP 4 (tonnes)	Reuse/Disposal - RISK REDUCTION STEP 5 (tonnes)																														
47,000te <small>Inventory</small>	<table border="0"> <tr> <td> 6,000</td> <td> 1,000</td> <td> 7,000</td> </tr> <tr> <td>quantities produced</td> <td>still to be produced</td> <td>total</td> </tr> </table> <p>86% COMPLETE</p>	6,000	1,000	7,000	quantities produced	still to be produced	total	<table border="0"> <tr> <td> 15,000</td> <td> 3,000</td> <td> 18,000</td> </tr> <tr> <td>consolidated</td> <td>still to consolidate</td> <td>total</td> </tr> </table> <p>84% COMPLETE</p>	15,000	3,000	18,000	consolidated	still to consolidate	total	<table border="0"> <tr> <td> 1,000</td> <td> 22,000</td> <td> 23,000</td> </tr> <tr> <td>treated</td> <td>still to treat</td> <td>total</td> </tr> </table> <p>4% COMPLETE</p>	1,000	22,000	23,000	treated	still to treat	total	<table border="0"> <tr> <td> 30,000</td> <td> 23,000</td> <td> 53,000</td> </tr> <tr> <td>current inventory</td> <td>still to be stored</td> <td>estimated total</td> </tr> </table> <p>57% COMPLETE</p>	30,000	23,000	53,000	current inventory	still to be stored	estimated total	<table border="0"> <tr> <td> <1,000</td> <td> 53,100</td> <td> 54,000</td> </tr> <tr> <td>sold/disposed</td> <td>still to be sold/disposed</td> <td>estimated total</td> </tr> </table> <p>2% COMPLETE</p>	<1,000	53,100	54,000	sold/disposed	still to be sold/disposed	estimated total
6,000	1,000	7,000																																	
quantities produced	still to be produced	total																																	
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<1,000	53,100	54,000																																	
sold/disposed	still to be sold/disposed	estimated total																																	
<small>Capability</small>	Magnox reprocessing - Sellafield	Consolidate stocks at Capenhurst	NO FACILITY CURRENTLY EXISTS Legacy Cylinder Facility currently in initiation phase - Capenhurst	Uranics store - Capenhurst THORP Product Store - Sellafield	NO DISPOSAL FACILITY CURRENTLY EXISTS. Geological Disposal Facility (GDF)																														
<small>Strategic Outcomes</small>	ALL URANIUM PRODUCED BY 2021	ALL URANIUM CONSOLIDATED BY 2025	ALL URANIUM TREATED BY 2055	ALL URANIUM IN LONG TERM STORAGE BY 2055	ALL URANIUM REUSED OR DISPOSED OF BY 2120																														
	When the NDA was established 47,000 te of uranium had already been produced from reprocessing or from an enrichment process.	The NDA is consolidating the vast bulk of uranic material at Capenhurst. A programme to move some Magnox Depleted Uranium (MDU) from Chapelcross to Capenhurst was completed in 2010.	Uranium hexafluoride (HEX) is a chemically hazardous by-product of the uranium enrichment process. A new facility is currently being designed in order to repackage 22,000 te of HEX at Capenhurst. After it is repackaged the HEX will be treated to remove the chemical hazard making it suitable for long-term storage.	NDA-owned Magnox Depleted Uranium (MDU), a product of spent fuel reprocessing, is stored in drums at Capenhurst. This will be held in storage until decisions are agreed on long-term management.	Remaining nuclear materials may need to be conditioned prior to transferring to a final disposal. Strategic options are currently being developed for the final management of this nuclear material.																														

Waste →

Redundant Buildings →



Integrated Waste Management

OBJECTIVE

To ensure that wastes are managed in a manner that protects people and the environment, now and in the future, and in ways that comply with government policies and provide value for money. Strategy 2016, p58

WHAT IS INTEGRATED WASTE MANAGEMENT?

Large quantities of diverse radioactive waste have been accumulating since the 1950s, and continue to arise. Managing that, and other conventional hazardous waste, is one of the NDA's biggest challenges.

HOW ARE THE WASTES MANAGED?

Wastes are characterised, treated appropriately according to radioactivity levels and handling requirements, before being packaged for long-term storage and/or transport and disposal. Low Level Waste (LLW) is disposed of and higher activity waste is stored pending development of a final disposal route.

WHAT HAS HAPPENED SINCE 2005?

The NDA has taken the decision to consolidate some Intermediate Level Waste (ILW) at regional stores, avoiding the need to construct a store at each site. We are repackaging material where necessary and investigating more sustainable treatments for all waste categories. We've followed the waste hierarchy principle and put in place a range of waste management services that has preserved capacity at the LLWR, meaning we no longer have to build a second repository.

WHAT HAS TO HAPPEN NEXT?

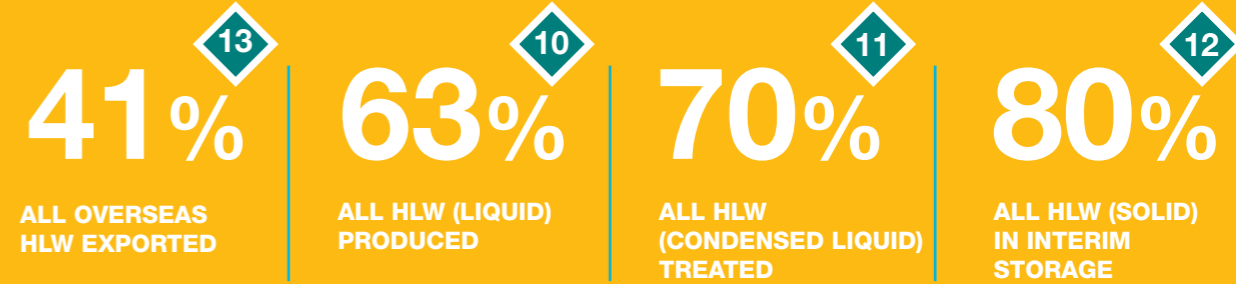
Reprocessing spent fuel, which produces highly radioactive liquid waste, is due to end in 2020. We are constructing new waste treatment plants as required. Permanent disposal facilities must be constructed for all higher activity waste.



ESTIMATED LIFETIME INVENTORY TO DISPOSE - SINCE 2005

High Level Waste (volume)		Intermediate Level Waste (volume)		Low Level Waste (volume)	
Raw	3,920 m ³	Raw	189,000 m ³	Raw	724,000 m ³
Packaged	1,630 m ³	Packaged	393,000 m ³	Packaged	255,000 m ³

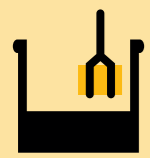
PROGRESS



STRATEGIC OUTCOMES - final steps to achieving our mission

	LOW LEVEL WASTE	Est. date of completion	Priorities	MISSION END	
1	ALL LLW PRODUCED	2125		LLWR + LANDFILL	
2	ALL LLW DIVERSION COMPLETED	2125			
3	ALL LLW DISPOSED	2125			
4	ALL VLLW DISPOSED	2125			
INTERMEDIATE LEVEL WASTE					
5	ALL ILW PRODUCED	2120		DISPOSAL	
6	ALL LEGACY WASTE RETRIEVED	2046	ONR PRIORITY		
7	ALL ILW TREATED	2120			
8	ALL ILW IN INTERIM STORAGE	2120			
9	ALL ILW DISPOSED	2125*			
	- Final disposal operational	2040	HMG PRIORITY		
HIGH LEVEL WASTE					
10	ALL HLW PRODUCED	2030	GROUP PRIORITY		DISPOSAL
11	ALL HLW TREATED	2030	GROUP PRIORITY		
12	ALL HLW IN INTERIM STORAGE	2030	GROUP PRIORITY		
13	ALL OVERSEAS HLW EXPORTED	2025	GROUP PRIORITY		
14	ALL HLW DISPOSED	2104			
	- Final disposal operational	2075	HMG PRIORITY		

*the policy for Scotland is to have near surface disposal, the final decision on which is not accounted for in this date.



Integrated Waste Management

To ensure that wastes are managed in a manner that protects people and the environment, now and in the future, and in ways that comply with government policies and provide value for money. *Strategy 2016, p58*

Low Level Waste (packaged volume)

Raw waste - **724,000 m³**
Packaged waste - **255,000 m³**

Intermediate Level Waste (packaged volume)

Raw waste - **189,000 m³**
Packaged waste - **393,000 m³**

LOW LEVEL WASTE

- To manage radioactive waste and dispose of it where possible, or place it in safe, secure and suitable storage, ensuring the delivery of UK and devolved administrations policies. *Strategy 2016, p61*

In 2019, work continues to divert LLW away from the Low Level Waste Repository prolonging the life of the facility.

Outputs

Inventory

Capability

Strategic Outcomes

Redundant Buildings

Quantities produced

- RISK REDUCTION STEP 1 (raw waste vol.m³)

155,000 quantities produced
569,000 estimated to be produced
724,000 estimated total

21% COMPLETE

LLW produced from NDA operations and decommissioning

1 ALL LLW PRODUCED BY 2129

Diversion

- RISK REDUCTION STEP 2 (raw waste vol.m³)

51,500 diverted
352,000 estimated still to divert
403,500 estimated total

13% COMPLETE

Diversion capabilities include - metal treatment and incineration

2 ALL LLW DIVERSION COMPLETED BY 2129

Disposal LLW

- RISK REDUCTION STEP 3 (packaged waste vol.m³)

47,000 LLW disposed
208,000 LLW estimated still to dispose
255,000 estimated total

18% COMPLETE

x2 sites Low Level Waste Repository and Dounreay

3 ALL LLW DISPOSED OF BY 2129

Disposal VLLW

- RISK REDUCTION STEP 4 (reported vol.m³)(landfill)

105,000 VLLW disposed
3,439,000 VLLW estimated still to dispose
3,544,000 estimated total

3% COMPLETE

A number of on site and off site licensed disposal routes.

4 ALL VLLW DISPOSED OF BY 2129

Large quantities of LLW arise from operating facilities, and will increasingly be produced over the next 100 years as sites are demolished. LLW contains only 0.0001% of overall radioactivity.

NDA instigated a policy of treating as much of the LLW as possible. The treatment separates out the radioactive and non radioactive parts so that only the LLW component needs to be disposed of. This has significantly reduced the estimated disposal volumes of LLW. Of the LLW that remains some of this is treated using supercompaction to reduce its volume.

The LLW Repository (LLWR) receives waste from NDA sites and other UK industries. For many decades, it was the UK's only licensed site where all types of LLW could be disposed of. Now Dounreay has two LLW vaults in operation with up to four more planned.

LLW with the very lowest levels of radioactivity, mainly soils and rubble, is known as VLLW. This can be disposed of: on site, for some Sellafield wastes; at specially licensed landfill sites; or other UK landfill sites, via the services provided by the LLW Repository.

INTERMEDIATE LEVEL WASTE

- To manage radioactive waste and dispose of it where possible, or place it in safe, secure and suitable storage, ensuring the delivery of UK and devolved administrations policies. *Strategy 2016, p61*

10,800m³ raw waste in store 2005

In 2019, ILW continues to be produced with a focus on retrieving waste from legacy ponds and silos.

STRATEGIC DECISION

Outputs

Inventory

Capability

Strategic Outcomes

Redundant Buildings

Quantities produced

- RISK REDUCTION STEP 1 (raw waste vol.m³)

55,000 quantity produced
113,000 still to produce
168,000 estimated total

33% COMPLETE

Waste from operations and decommissioning

5 ALL ILW PRODUCED BY 2120

Legacy ponds & silos

- RISK REDUCTION STEP 2 (raw waste vol.m³)

ONR PRIORITY

1,300 retrieved since 2005
20,000 still to retrieve
21,300 estimated total

6% COMPLETE

New technology and capability projects to retrieve legacy waste

6 ALL LEGACY WASTE RETRIEVED BY 2046

Treatment

- RISK REDUCTION STEP 3 (raw waste vol.m³)

17,000 treated
175,000 still to treat
192,000 estimated total

9% COMPLETE

New capability required

7 ALL ILW TREATED BY 2120

Interim storage

- RISK REDUCTION STEP 4 (packaged waste vol.m³)

53,000 current inventory
340,000 still to be stored
393,000 estimated total

13% COMPLETE

New capability required

8 ALL ILW IN INTERIM STORAGE BY 2120

Disposal

- RISK REDUCTION STEP 5 (packaged waste vol.m³)

0 disposed of
393,000 still to be disposed
393,000 estimated total

0% COMPLETE

NO FACILITY CURRENTLY EXISTS Geological Disposal Facility (GDF)

9 ALL ILW DISPOSED OF BY 2125 - final disposal operational in 2040

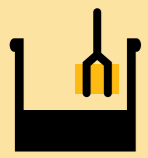
Future waste will be produced in the form of buildings and equipment. This quantity will fluctuate as the categories and volumes of radioactive waste are better understood over time.

Retrieval of waste from the legacy ponds and silos is the NDA's highest priority and will reduce the risk from these facilities.

Raw ILW requires different types of treatment so it can be conditioned and packaged for storage. Dozens of treatment plants already operate across the 17 sites, while others are under construction or in planning. Approximately 40 new treatment plants will be required to complete the mission.

7% of the mission completed since NDA was formed. Approximately 11 new stores will be required to complete the mission to support Sellafield and long term storage on Scottish sites.

The UK government is working with technical specialists, communities and regulators to develop a geological disposal facility for ILW in England and Wales. The policy for Scotland is to have near surface disposal.



Integrated Waste Management

To ensure that wastes are managed in a manner that protects people and the environment, now and in the future, and in ways that comply with government policies and provide value for money. *Strategy 2016, p58*

ESTIMATED LIFETIME INVENTORY TO DISPOSE - SINCE 2005

High Level Waste <i>(packaged volume)</i>	
Raw waste	3,920 m³
Packaged	1,630 m³

HIGH LEVEL WASTE - To manage radioactive waste and dispose of it where possible, or place it in safe, secure and suitable storage, ensuring the delivery of UK and devolved administrations policies. *Strategy 2016, p61*

In 2019, work will continue to treat and store HLW on an interim basis.

Outputs

Inventory

Capability

Strategic Outcomes

Redundant Buildings

Quantities produced

- RISK REDUCTION STEP 1 (raw waste vol.m³)

GROUP PRIORITY LIQUID

	2,470 quantity produced	1,450 still to produce	3,920 total
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63% COMPLETE

Highly Active Storage Tanks

ALL HIGH LEVEL LIQUID PRODUCED BY 2030 (INCLUDE POST OPERATIONAL CLEAN OUT)

In the UK, HLW exists only at Sellafield. In its raw form, it is a highly active liquor (HAL) by-product from THORP and Magnox, both are due to stop reprocessing by 2020. Evaporator plants reduce the liquid volumes before transfer to storage tanks.

Treatment

- RISK REDUCTION STEP 2 (raw waste vol.m³)

GROUP PRIORITY CONDENSED LIQUID

	510 treated	220 still to treat	730 total
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70% COMPLETE

Waste Vitrification Plant

ALL HIGH LEVEL WASTE TREATED BY 2030

The liquid waste is converted to a solid glass block in a process known as vitrification. This waste form holds the radioactive components within the glass matrix in a form which can be disposed.

Interim storage

- RISK REDUCTION STEP 3 (packaged vol.m³)

GROUP PRIORITY SOLID

	1,200 current inventory	280 still to store	1,480 estimated total
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81% COMPLETE

Vitrified Product Store (VPS)

ALL HIGH LEVEL WASTE IN INTERIM STORAGE BY 2030

The vitrified product will be stored in Sellafield's Vitrified Product Store(s) where it will remain until a UK disposal facility becomes available.

Disposal/Export

- RISK REDUCTION STEP 4 (packaged vol.m³)

	150 exported	1,480 still to be exported or disposed	1,630 total
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9% COMPLETE

Residue Export Facility
NO FACILITY CURRENTLY EXISTS
Geological Disposal Facility (GDF)

ALL OVERSEAS HIGH LEVEL WASTE EXPORTED BY 2025
 ALL HIGH LEVEL WASTE DISPOSED BY 2104 - Final HLW disposal available from 2075

Sellafield also earns revenue by processing spent fuel for overseas customers. All the waste from these operations is returned as part of contractual requirements. 41% of all overseas HLW has been exported.

Low Level Waste Repository in Cumbria



Inside the ILW store at Trawsfynydd



Vitrified HLW Store at Sellafield





Site Decommissioning and Remediation

OBJECTIVE

To decommission and remediate our designated sites, and release them for other uses.

Strategy 2016, p24

WHAT IS SITE DECOMMISSIONING AND REMEDIATION?

The NDA is cleaning up each site safely and cost-effectively for eventual release. This requires all facilities to be decommissioned, waste removed, structures demolished and the land remediated.

WHAT HAS TO BE DONE?

The NDA must define the final condition for each site, including any remaining structures, infrastructure such as roads or services and the land itself. This influences future plans and near-term work targets, and shapes current activities.

WHAT HAS HAPPENED SINCE 2005?

Many structures have already been dismantled and demolished, and land released. The NDA is assessing alternatives for the final stages of decommissioning that could lead to simple regulatory controls, earlier release of land and the potential for future employment opportunities when sites are released.

WHAT HAS TO HAPPEN NEXT?

Decommissioning, dismantling and remediation activities are continuing at all sites, as well as regulatory reviews to determine the approach to final site clearance.



Buildings (radioactive)

Opening stock	803
New builds	90
Total	893

Sites

Opening stock	17
Final disposal tbc	?
Total	17

Land (designated hectares)

Opening stock	1,046
Final disposal tbc	?
Total	1,046

Land (remediated hectares)

Opening stock	1,046
Interim State	79
Possible contamination	650
End State	317
Total	1,046

PROGRESS

KEY STEPS TO ACHIEVING THE STRATEGIC OUTCOMES

46%²
BUILDINGS COMPLETED PRIMARY FUNCTION

26%³
BUILDINGS COMPLETED DECOMMISSIONING

23%⁴
BUILDINGS DEMOLISHED OR REUSED

9%⁸
LAND DEDESIGNATED OR REUSED

STRATEGIC OUTCOMES - final steps to achieving our mission

	OPERATIONAL AND PLANNED	Est. date of completion	Priorities	MISSION END
1	ALL PLANNED NEW BUILDINGS OPERATIONAL	2090		BUILDINGS COMPLETED
2	ALL BUILDINGS PRIMARY FUNCTION COMPLETED	2125		
<hr/>				
	DECOMMISSIONING AND DEMOLITION			DECOMMISSIONED AND DEMOLISHED
3	ALL BUILDINGS DECOMMISSIONED	2125		
4	ALL BUILDINGS DEMOLISHED OR REUSED	2125		
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	SITES			DEDESIGNATED OR REUSED
5	ALL SITES IN INTERIM STATE - Next site achieve its interim state (Bradwell)	2125 2019		
6	ALL SITES MISSION COMPLETED - First site to complete its mission (Winfrith)	2125 2025		
7	ALL CONTAMINATED LAND REMEDIATED - Next land to be remediated (Harwell)	2125 2020		
8	ALL LAND DEDESIGNATED OR REUSED - Next land to be dedesignated/reused (LLWR)	2125 2020		



Site Decommissioning and Remediation

To decommission and remediate our designated sites, and release them for other uses. *Strategy 2016, p24*

Buildings (radioactive)	
Opening stock	803
New builds	90
Total	893

Sites	
Opening stock	17
Final disposal tbc	?
Total	17

Land (designated hectares)	
Opening stock	1,046
Final disposal tbc	?
Total	1,046

Land (remediated hectares)	
Opening stock	1,046
Interim State	79
Possible contamination	650
End state	317
Total	1,046

DECOMMISSIONING (radioactive buildings) - To deliver Site End States as soon as reasonably practicable with a progressive reduction of risk and hazard. *Strategy 2016, p28*

Opening stock 2005

NDA sites are making good progress decommissioning buildings that are no longer required, however a number of new builds are still required to deliver the Mission.

STRATEGIC DECISION

Since 2005 26% of operational buildings have been decommissioned.

803
No. of radioactive buildings (not including new builds)

Inventory

Strategic Outcomes

Operational and planned

- RISK REDUCTION STEP 1 (No. of radioactive buildings)

90 planned new builds	392 currently operational	411 completed primary function since 2005
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46% COMPLETED PRIMARY FUNCTION

- 1 ALL PLANNED NEW BUILDINGS OPERATIONAL BY 2090
- 2 ALL BUILDINGS COMPLETED PRIMARY FUNCTION BY 2125

When radioactive buildings near the end of their operational life, a phase of work begins to move the plant into decommissioning. The phase generally starts well before operations finish and removes most, if not all nuclear hazards. New buildings are still to be built to support the decommissioning mission, for example to package and temporarily store waste. Ultimately, these new buildings will go through the same process once their operational life is complete.

Decommissioning

- RISK REDUCTION STEP 2 (No. of radioactive buildings)

411 total	57 in post operational clean out	68 in decontamination and dismantling	50 in care and maintenance	236 completed decommissioning since 2005
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26% COMPLETED DECOMMISSIONING (not including new builds)

- 3 ALL BUILDINGS TO HAVE COMPLETED DECOMMISSIONING BY 2125

The current strategy for decommissioning Magnox reactors is to pause at an interim state termed 'Care and Maintenance', where structures are made safe for several decades before final site clearance occurs. The NDA is reviewing the Magnox strategy to determine whether this is appropriate as a blanket strategy for all reactors in the Magnox fleet.

Demolition or reuse

- RISK REDUCTION STEP 3 (No. of radioactive buildings)

236 total	15 awaiting demolition	16 in demolition	205 demolished or reuse since 2005
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23% DEMOLISHED OR REUSED

- 4 ALL BUILDINGS DEMOLISHED OR REUSED BY 2125

Final demolition is dominated by non nuclear risks. The extent of final dismantling and demolition depends on the agreed end state. It typically generates large volumes of waste, a proportion of which may be contaminated with radioactivity.

LAND USE (sites) - To optimise the reuse of NDA sites. *Strategy 2016, p38*

Opening stock 2005

The NDA Mission is not complete until all Designated Directions associated with the land have been removed. Since 2005 we have completed 9% of the mission.

MISSION END

1,046
hectares

Inventory

Strategic Outcomes

Sites status

- RISK REDUCTION STEP 1 (No. of sites)

17 operational sites	0 sites in interim state	0 sites that have completed the mission
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0% COMPLETE

- 5 ALL SITES IN INTERIM STATE BY 2120
- the next site to reach its interim state by 2019 (Bradwell)
- 6 ALL SITES MISSION COMPLETED BY 2125
- the first site to complete its mission by 2025 (Winfrith)

Bradwell will be the first site in the UK nuclear industry to reach its interim state in 2019. The first site to complete its mission will be Winfrith in 2025.

Remediation of land

- RISK REDUCTION STEP 2 (hectares)

650 total area potential/known land contaminated	79 interim state	317 end state	1,046 total
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41% REMEDIATED OR CLEARED SINCE 2005

- 7 ALL CONTAMINATED LAND REMEDIATED BY 2125
- the next land to be remediated by 2020 (Harwell)

The NDA is working with regulators, SLCs and other stakeholders on the optimal end state for each site. The NDA and the regulators are reviewing regulation covering the latter stages of decommissioning and clean-up to give SLCs flexibility in defining the most appropriate end state for the sites. The NDA is also working with local authorities on their development plans, to ensure proposed end states and development plans are aligned.

Dedesignated or reused land

- RISK REDUCTION STEP 3 (hectares)

93 total land dedesignated	tbd total land reused	953 total still to be dedesignated or reused
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9% COMPLETE

- 8 ALL LAND DEDESIGNATED OR REUSED BY 2125
- the next land to be dedesignated or reused by 2020 (LLWR)

In 2005, the NDA was given responsibility for 1,046 hectares of land, under a 'designating' order by the Secretary of State 'De-designating' this order signifies that the NDA's mission is complete. Parts of Berkeley are now a college campus while land at Harwell and Winfrith have been developed as business parks. 3 hectares of land at Winfrith were de-designated in Feb 2019.