Mission Progress Report
Published November 2021

Cleaning up the UK’s earliest nuclear sites, caring for people and the environment
Foreword

THE MISSION
Our mission is to clean up the UK’s early nuclear sites safely, securely and cost effectively with care for people and the environment.

THE MISSION PROGRESS REPORT
Following the publication of our updated Strategy (4th edition) in 2021, the Mission Progress Report has been revised to incorporate strategic changes.

The document continues to demonstrate our approach to reporting progress against the mission, focusing on the four driving themes outlined in our strategy that are common across all sites and that help us to measure our achievements.

We, like other organisations, have had to deal with the challenges of the COVID-19 pandemic during 2020/21. The NDA group has responded with professionalism and empathy to our workforce. The pandemic has impacted many of our operations, with slowdowns and pauses experienced during the year. All of the NDA group companies have worked well together throughout this difficult period to support the delivery of the mission.

Progress continues to be made as we safely manage our nuclear inventory and reduce the risks associated with it. Over the duration of our mission (120+ years) more strategic outcomes will be achieved with the closure of the reprocessing facilities and the building of new modern treatment and storage facilities to manage nuclear material and waste, ultimately working towards the final disposal of nuclear inventory and the release of land for other economic uses.

We are committed to improving the way we embed sustainability into our operations to support the UK’s net-zero greenhouse gas emissions target, set out by the Government in 2019. Fighting climate change is a national priority and we’ve made carbon net-zero a priority across the NDA group.

David Peattie
NDA Chief Executive

HOW TO READ THIS REPORT
This report is structured to illustrate the progress against the strategic objectives outlined in our strategy.

As a consequence of publishing our new version of the NDA Strategy in March 2021, we have revised some detail for a number of outcomes to ensure they continue to align with our fresh approach.

In the first 2 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 four 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.

We continue to build a more accurate picture of work that’s still to be completed across our sites. As the data range matures over the next 120+ years, along with the reduction of uncertainty of the inventory, progression in the lifecycle and strategy development, it may well be subject to change.

The figures contained within this report are correct up to 31 March 2021 from NDA group data sources and delivery programmes.

On 23 June 2021 the NDA, UK Government and EDF Energy entered into new decommissioning arrangements for seven Advanced Gas-cooled Reactor (AGR) stations. Government has directed the NDA to take on the future ownership of the stations after defueling for decommissioning. The work will be undertaken by the NDA subsidiary Magnox Ltd. We will incorporate each of these stations into the report at the appropriate time.

Excluded from this report are critical enablers, liquid and gaseous discharges, non-NDA liabilities and non-radioactive waste elements of our strategy.

David Peattie
NDA Chief Executive
We use 5 strategic themes to describe all the activities needed to deliver the NDA’s mission.

Our strategic approach and themes

The first 4, Spent Fuels, Nuclear Materials, Integrated Waste Management and Site Decommissioning and Remediation relate directly to our clean-up and decommissioning and are known as driving themes. All data in this report comes from those 4 themes. The fifth theme describes the important activities needed to support the delivery of our mission and is known as critical enablers. The diagram below demonstrates how they interplay.

These areas are all 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.

Our 4 driving themes

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. Once spent fuel is removed from a reactor, it is stored in a pond or dry store until it can be dispatched to Sellafield.

Reprocessing extracts materials (plutonium and uranium) that could potentially be re-used and also generates highly radioactive wastes, or ‘fission products’.

The NDA’s strategy is to bring the reprocessing programme to an end. The THORP reprocessing plant has already closed and the Magnox reprocessing plant will follow. All remaining spent fuel will be safely stored until a permanent solution for disposal is available.

Our spent fuel work is separated into 15 strategic outcomes that we must deliver, see p4. For more detail on our spent fuels strategy see NDA Strategy 2021, p44-57.

Nuclear Materials

Our strategy defines our approach to dealing with the inventory of uranics and plutonium currently stored on some of our sites. These nuclear materials are by-products from different phases of the fuel cycle, either manufacturing or reprocessing. All nuclear materials must be managed safely and securely, by either converting them into new fuel or immobilising and storing them until a permanent UK disposal facility is available.

All of our plutonium is stored at Sellafield. Our uranium is located at a number of our sites and we are continuing to consolidate it at sites, which we consider are best suited to its management.

Our nuclear materials work is separated into 10 strategic outcomes that we must deliver, outlined on page 4. For more detail on our nuclear materials strategy see NDA Strategy 2021, p58-67.

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. Managing the large quantities of radioactive waste from electricity generation, research, the early defence programme and decommissioning is one of the NDA’s biggest challenges. Some of this radioactive waste is in a raw (untreated) form, some has been treated and is being interim stored and, in the case of low level waste, some has already been permanently disposed of.

Retrieving, treating and interim storing the radioactive waste from Sellafield’s four legacy ponds and silo facilities is the NDA’s highest priority. Our integrated waste management work is separated into 14 strategic outcomes that we must deliver, outlined on page 4. For more detail on our IWM strategy see NDA Strategy 2021, p68-85.

Site Decommissioning and 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.

After the buildings on our sites have been decommissioned, decontaminated and dismantled the land will be cleaned up to allow it to be released for other uses. At that point, its ownership would transfer to the new user of the land.

The NDA is currently assessing alternatives for the final stages of decommissioning that could lead to earlier release of land, continued employment and opportunities to reuse the land.

Our site decommissioning and remediation work is separated into 8 strategic outcomes that we must deliver, outlined on page 4. For more detail on our SDR strategy see NDA Strategy 2021, p26-45.

NOTES: This diagram is purely illustrative of the concepts and does not represent the complexity of all of the themes.
## Plutonium Operational and Planned Decommissioning and Demolition Sites

All plutonium produced: 97%

All plutonium consolidated: 100%

A: All plutonium repacked in long-term storage
B: All cans not suitable for extended storage repackaged

All plutonium in interim storage: 0%

All plutonium reused or disposed: 0%

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## Uranium Operational and Planned Decommissioning and Demolition Sites

All uranium produced: 93%

All uranium consolidated: 80%

All uranium treated: 4%

All uranium in interim storage: 56%

All uranium reused or disposed: 1%

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## Integrated Waste Management Operational and Planned Decommissioning and Remediation

### LOW LEVEL WASTE

All LLW produced: 7%

All LLW treated: 8%

All waste suitable for disposal in NDA facilities: 14%

All waste suitable for permitted landfill disposed: 4%

### INTERMEDIATE LEVEL WASTE

All ILW produced: 33%

All legacy waste retrieved: 8%

All ILW treated: 9%

All ILW in interim storage: 15%

All ILW disposed: 0%

### HIGH LEVEL WASTE

All HLW produced: 68%

All HLW treated: 73%

All HLW waste in interim storage: 83%

All overseas HLW exported: 11%

All HLW disposed: 0%

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## Site Decommissioning and Remediation Operational and Planned Decommissioning and Remediation

All planned new buildings operational: TBD

All buildings primary function completed: 35%

All buildings decommissioned: 18%

All buildings demolished or reused: 16%

All land delicensed or relicensed: 9%

All land in End State - all planned physical work complete: 41%

All land demonstrated as suitable for reuse: 9%

All land de-designated or reused: 9%

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950 hectares of designated land on nuclear licensed sites remain to be cleaned up.
Spent Fuels

ESTIMATED LIFETIME INVENTORY - 2005 TO MISSION END

<table>
<thead>
<tr>
<th>Spent Magnox Fuel</th>
<th>Spent Oxide Fuel</th>
<th>Spent Exotic Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening stock</td>
<td>Opening stock</td>
<td>Opening stock</td>
</tr>
<tr>
<td>2,810 te</td>
<td>3,150 te</td>
<td>199 te</td>
</tr>
<tr>
<td>Defueling</td>
<td>Receiving</td>
<td>Defueling</td>
</tr>
<tr>
<td>4,100 te</td>
<td>5,290 te</td>
<td>33 te</td>
</tr>
<tr>
<td>Legacy</td>
<td>Total</td>
<td>Total</td>
</tr>
<tr>
<td>500 te</td>
<td>8,440 te</td>
<td>232 te</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7,410 te</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 consolidated at Sellafield for management. Some spent fuels are reprocessed into uranium and plutonium, potentially for re-use, leaving some residual waste. Once reprocessing ends (estimated 2022), remaining spent fuel will be stored for future disposal.

WHAT HAS HAPPENED SINCE 2005?
The Magnox reactors are now all defuelled and most fuel has been reprocessed. THORP completed reprocessing operations of oxide fuels in 2019.

WHAT HAS TO HAPPEN NEXT?
No more oxide fuels will be reprocessed. Sellafield continues to receive oxide fuel under commercial contracts with EDF Energy. The Magnox reprocessing plant, which is Sellafield’s last reprocessing facility, is expected to finish operations in about a year’s time. All remaining spent fuel will be placed in interim storage pending a decision whether to classify it as waste for disposal.

OBJECTIVE
To ensure safe, secure and cost-effective lifecycle management of our spent fuels - Strategy 2021, p46

STRATEGIC OUTCOMES - steps to achieving our mission

<table>
<thead>
<tr>
<th>SPENT MAGNOX FUEL</th>
<th>Progress up to 2021</th>
<th>End date</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. All sites defueled</td>
<td>100%</td>
<td>2020</td>
<td>COMPLETED</td>
</tr>
<tr>
<td>2. All legacy Magnox fuel retrieved</td>
<td>25%</td>
<td>2025</td>
<td></td>
</tr>
<tr>
<td>3. All Magnox fuel reprocessing completed</td>
<td>94%</td>
<td>2022</td>
<td></td>
</tr>
<tr>
<td>4. All remaining Magnox fuel in interim storage</td>
<td>25%</td>
<td>2025</td>
<td></td>
</tr>
<tr>
<td>5. All remaining Magnox fuel disposed</td>
<td>0%</td>
<td>2125</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPENT OXIDE FUEL</th>
<th>Progress up to 2021</th>
<th>End date</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. All EDFE oxide fuel received</td>
<td>54%</td>
<td>2035</td>
<td></td>
</tr>
<tr>
<td>7. All legacy fuel retrieved</td>
<td>100%</td>
<td>2016</td>
<td>COMPLETED</td>
</tr>
<tr>
<td>8. All oxide fuel reprocessing completed</td>
<td>100%</td>
<td>2019</td>
<td>COMPLETED</td>
</tr>
<tr>
<td>9. All remaining oxide fuel in interim storage</td>
<td>49%</td>
<td>2035</td>
<td></td>
</tr>
<tr>
<td>10. All remaining oxide fuel disposed</td>
<td>0%</td>
<td>2125</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPENT EXOTIC FUEL</th>
<th>Progress up to 2021</th>
<th>End date</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. All exotic fuel defueled</td>
<td>67%</td>
<td>2024</td>
<td></td>
</tr>
<tr>
<td>12. All exotic fuel consolidated*</td>
<td>55%</td>
<td>2028</td>
<td></td>
</tr>
<tr>
<td>13. All exotic fuel reprocessing completed</td>
<td>90%</td>
<td>2022</td>
<td></td>
</tr>
<tr>
<td>14. All remaining exotic fuel in interim storage</td>
<td>83%</td>
<td>2028</td>
<td></td>
</tr>
<tr>
<td>15. All remaining exotic fuel disposed</td>
<td>0%</td>
<td>2125</td>
<td></td>
</tr>
</tbody>
</table>

*irradiated fuel only
SPENT MAGNOX FUEL - To ensure safe, secure and cost-effective lifecycle management of spent Magnox fuels. Strategy 2021, p52.

In 2021, work continues to retrieve high hazard fuel from Sellafield, complete reprocessing and safely store the spent fuel on an interim basis.

Defueling

<table>
<thead>
<tr>
<th>Opening stock 2005</th>
<th>2,810 te</th>
</tr>
</thead>
</table>

Legacy fuel retrieval

<table>
<thead>
<tr>
<th>Defueled</th>
<th>Still to defuel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,100</td>
<td>0</td>
<td>4,100</td>
</tr>
</tbody>
</table>

100% COMPLETE

All 26 reactors on 11 sites have been defueled. All sites defueled by 2020.

Spent fuel arriving at Sellafield was originally stored in the First Generation Magnox Storage Pond (FGMSP) and Pile Fuel Storage Pond (PFSP) before transfer for reprocessing.

FGMSP is one of the estate's most hazardous facilities. Some fuel was also contained in the Pile Fuel Storage Pond (PFSP).

Reprocessing

<table>
<thead>
<tr>
<th>Retrieved</th>
<th>Still to retrieve</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>370</td>
<td>500</td>
</tr>
</tbody>
</table>

2021 25% COMPLETE

First Generation Magnox Storage Pond (FGMSP) and Pile Fuel Storage Pond (PFSP) - Sellafield

All legacy Magnox fuel retrieved by 2025.

Spent fuel arriving at Sellafield was originally stored in the First Generation Magnox Storage Pond (FGMSP) before transfer for reprocessing.

Reprocessing was aiming to complete reprocessing prior to the end of 2020. Due to the COVID-19 pandemic this is no longer possible. The final date for completion is still to be confirmed, but is likely to be 2022.

Magnox reprocessing plants - Sellafield

Interim storage

<table>
<thead>
<tr>
<th>Current inventory</th>
<th>Still to store</th>
<th>Estimated total</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>370</td>
<td>500</td>
</tr>
</tbody>
</table>

2021 25% COMPLETE

Fuel Handling Plant (FHP) - Sellafield

All Magnox fuel reprocessing completed in 2022.

There are some degraded fuels either still in, or which have been recovered from the legacy ponds, FGMSP and PFSP. As much of this material is heavily degraded it is not suitable for reprocessing in our existing facilities. To reduce the risk of managing these fuels some of it has been transferred to the more modern pond, Fuel Handling Plant (FHP), where it will be stored until it can be transferred into dry storage. We expect to update this estimated total following the completion of reprocessing.

Fuel Handling Plant (FHP) - Sellafield

Reuse/Disposal

<table>
<thead>
<tr>
<th>Volume disposed</th>
<th>Still to dispose</th>
<th>Estimated total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

2021 50% COMPLETE

No facility currently exists Geological Disposal Facility (GDF) and Conditioning Plant

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.

Artist's impression of a Geological Disposal Facility

Outputs

- Plutonium
- Uranium
- Waste
- Redundant Buildings

STRATEGIC DECISIONS

- Plutonium
- Uranium
- Waste
- Redundant Buildings

Strategic Outcome

- Inventory
- Capability
- Opening stock 2005
- 2,810 te

Defueling activity at one of the Magnox stations

Pile Fuel Storage Pond - Sellafield

Magnox Reprocessing Plant - Sellafield

Fuel Handling Plant - Sellafield

Artist's impression of a Geological Disposal Facility
Spent Fuels

To ensure safe, secure and cost-effective lifecycle management of spent fuels. Strategy 2021, p46

<table>
<thead>
<tr>
<th>SPENT OXIDE FUEL</th>
<th>- To ensure safe, secure and cost-effective lifecycle management of spent oxide fuels. Strategy 2021, p50.</th>
</tr>
</thead>
</table>

In 2021, 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.

<table>
<thead>
<tr>
<th>Receipts</th>
<th>Legacy fuel retrieval</th>
<th>Reprocessing</th>
<th>Interim storage</th>
<th>Reuse/Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,840 received</td>
<td>3 retrieved</td>
<td>3,610 reprocessed</td>
<td>2,390 current inventory</td>
<td>0 volume disposed</td>
</tr>
<tr>
<td>2,450 still to be received</td>
<td>0 still to retrieve</td>
<td>0 still to reprocess</td>
<td>2,440 still to store</td>
<td>4,830 still to be disposed</td>
</tr>
<tr>
<td>5,290 total</td>
<td>3 total</td>
<td>3,610 total</td>
<td>4,830 estimated total</td>
<td>4,830 estimated total</td>
</tr>
</tbody>
</table>

2021 54% COMPLETE 100% COMPLETE 49% COMPLETE 0% COMPLETE

2021 100% COMPLETE 100% COMPLETE 100% COMPLETE 0% COMPLETE

The NDA is committed, through commercial contracts, to receiving and managing spent fuel (including 3,150te opening stock) from EDF’s 7 AGR power stations in England and Scotland. The last of these power stations is due to close in 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.

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

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 remains 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 included the opening stock of 3,150te.

Our strategy is to consolidate all spent AGR fuel from the EDF AGR stations in a single pond in the THORP facility at the Sellafield site, and interim store all oxide fuels pending a future decision on whether to classify the fuel as waste for disposal in a GDF.

Removal 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.

<table>
<thead>
<tr>
<th>STRATEGIC DECISIONS</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory</td>
<td>Plutonium Uranium</td>
</tr>
<tr>
<td>Capability</td>
<td>Waste</td>
</tr>
<tr>
<td>Strategic Outcome</td>
<td>Redundant Buildings</td>
</tr>
</tbody>
</table>

ESTIMATED LIFETIME INVENTORY - 2005 TO MISSION END

Spent Oxide Fuel
Opening stock 3,150 te
Receiving 5,290 te
Total 8,440 te

Hinkley Point A and the EDF owned (B) station
Shearing operations - Sellafield
THORP - Sellafield
THORP Receipt and Storage Pond - Sellafield
Artist’s impression of a Geological Disposal Facility
To ensure safe, secure and cost-effective lifecycle management of spent fuels.

Strategy 2021, p54.

### SPENT EXOTIC FUEL

To ensure safe, secure and cost-effective lifecycle management of spent exotic fuels. Strategy 2021, p54.

In 2021, work continues to defuel the Dounreay Fast Reactor, consolidate exotic fuel at Sellafield and complete reprocessing.

A variety 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). Previously, some of the fuel that was removed from DFR prior to 2005 was included in the report. Of the 44te only 33te remained in the reactor in 2005.

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.

The majority of Spent Exotic fuel has already been reprocessed at Sellafield’s THORP and Magnox reprocessing plants. The strategy for DFR fuel, which is being consolidated to Sellafield, is to reprocess as much as is practicable before the Magnox reprocessing plant ceases operations. The final date for completion is still to be confirmed, but is likely to be in 2022.

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.

Removal of plutonium from reprocessing facilities is planned. The 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.

### ESTIMATED LIFETIME INVENTORY - 2005 TO MISSION END

<table>
<thead>
<tr>
<th>Spent Exotic Fuel</th>
<th>Opening stock</th>
<th>Defueling</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>199 te</td>
<td>33 te</td>
<td>232 te</td>
<td></td>
</tr>
</tbody>
</table>

### STRATEGIC DECISIONS

**Outputs**

<table>
<thead>
<tr>
<th>Inventory</th>
<th>Capability</th>
<th>Strategic Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>199 te</td>
<td>33 te</td>
<td>232 te</td>
</tr>
</tbody>
</table>

### Defueling

- **Dounreay Fast Reactor (DFR)**
  - 33 te total
  - 22 defueled
  - 11 still to defuel

**Strategic Decision:**

- 67% COMPLETE

### Consolidation (irradiated)

- 31 consolidated
- 25 still to consolidate

**Strategic Decision:**

- 50% COMPLETE

### Reprocessing

- 82 reprocessed
- 9 still to reprocess

**Strategic Decision:**

- 90% COMPLETE

### Interim storage

- 117 current inventory
- 24 still to store

**Strategic Decision:**

- 83% COMPLETE

### Reuse/Disposal

- 0 volume disposed
- 141 still to be managed
- 141 estimated total

**Strategic Decision:**

- 0% COMPLETE

### Artistic impression of a Geological Disposal Facility

- Artist’s impression of a Geological Disposal Facility

- Geologically conditioned plant

### Strategic Options

1. To ensure safe, secure and cost-effective lifecycle management of Spent Exotic Fuels.
2. To consolidate exotic fuel at Sellafield and complete reprocessing.
3. To reprocess as much as is practicable before the Magnox reprocessing plant ceases operations.
4. To develop strategic options for the final management of exotic fuels.

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In 2021, work continues to defuel the Dounreay Fast Reactor, consolidate exotic fuel at Sellafield and complete reprocessing.

- **Dounreay Fast Reactor:**
  - 22 defueled
  - 11 still to defuel
  - 31 consolidated
- **THORP and Magnox Reprocessing Plants - Sellafield:**
  - 82 reprocessed
  - 91 total
- **Interim Storage:**
  - 117 current inventory
  - 141 estimated total
- **Transporting Exotic Fuel to Sellafield:**
  - 31 consolidated
- **THORP Receipt and Storage Pond - Sellafield:**
  - 24 still to store
- **Consolidated Stocks at Sellafield:**
  - 111 consolidated
- **Removal of Plutonium from Reprocessing Facilities:**
  - 0 volume disposed
- **Current Inventory:**
  - 232 te total
- **Strategic Objectives:**
  - 90% COMPLETE
  - 67% COMPLETE
  - 55% COMPLETE
  - 0% COMPLETE

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### Strategic Objectives

- **2021:**
  - 90% COMPLETE
  - 67% COMPLETE
  - 55% COMPLETE
  - 0% COMPLETE
- **2022:**
  - 83% COMPLETE
  - 90% COMPLETE
  - 67% COMPLETE
  - 0% COMPLETE
- **2023:**
  - 75% COMPLETE
  - 75% COMPLETE
  - 67% COMPLETE
  - 0% COMPLETE
- **2024:**
  - 75% COMPLETE
  - 75% COMPLETE
  - 67% COMPLETE
  - 0% COMPLETE
- **2025:**
  - 75% COMPLETE
  - 75% COMPLETE
  - 67% COMPLETE
  - 0% COMPLETE
- **2026:**
  - 75% COMPLETE
  - 75% COMPLETE
  - 67% COMPLETE
  - 0% COMPLETE
- **2027:**
  - 75% COMPLETE
  - 75% COMPLETE
  - 67% COMPLETE
  - 0% COMPLETE
- **2028:**
  - 75% COMPLETE
  - 75% COMPLETE
  - 67% COMPLETE
  - 0% COMPLETE

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### Notes

- **In 2021:**
  - Work continues to defuel the Dounreay Fast Reactor, consolidate exotic fuel at Sellafield and complete reprocessing.
- **2021 Inventory:**
  - 199 te Opening stock
  - 33 te Defueling
  - 232 te Total
- **2021 Strategic Objectives:**
  - 90% COMPLETE
- **2021 Reuse/Disposal:**
  - 0 volume disposed
  - 141 still to be managed
  - 141 estimated total
- **2021 Consolidation (irradiated):**
  - 31 consolidated
- **2021 Defueling:**
  - 22 defueled
  - 11 still to defuel
- **2021 Reprocessing:**
  - 82 reprocessed
  - 9 still to reprocess
- **2021 Interim Storage:**
  - 117 current inventory
  - 24 still to store
- **2021 Strategic Decisions:**
  - To ensure safe, secure and cost-effective lifecycle management of spent exotic fuels.
  - To consolidate exotic fuel at Sellafield and complete reprocessing.
  - To reprocess as much as is practicable before the Magnox reprocessing plant ceases operations.
  - To develop strategic options for the final management of exotic fuels.

---

### Additional Information

- **Spent Fuels:**
  - 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).
  - Previously, some of the fuel that was removed from DFR prior to 2005 was included in the report. Of the 44te only 33te remained in the reactor in 2005.
  - 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.
  - The majority of Spent Exotic fuel has already been reprocessed at Sellafield’s THORP and Magnox reprocessing plants.
  - The strategy for DFR fuel, which is being consolidated to Sellafield, is to reprocess as much as is practicable before the Magnox reprocessing plant ceases operations.
  - The final date for completion is still to be confirmed, but is likely to be in 2022.
  - 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.
  - Strategic options are currently being developed for the final management of this fuel.
  - Remaining fuel will need to be conditioned prior to transferring to a final disposal solution.
Nuclear Materials

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 stored safely and securely under stringent management arrangements, in accordance with the requirements of the International Atomic Energy Agency (IAEA), as well as UK law, which are overseen by the independent Office for Nuclear Regulation (ONR) which is responsible for regulating safety and security across the UK.

WHAT HAS HAPPENED SINCE 2005?
The NDA is working with UK government and suppliers on options to put plutonium beyond reach. The NDA has largely completed uranium 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 of plutonium is now complete. Consolidation of uranium remains ongoing. Some uranium must be treated and repackaged for interim storage, while Sellafield’s plutonium inventory will be repackaged. Plutonium will be repackaged in a form suitable for long term storage. The government will reach a decision on possible re-use or disposal of plutonium following completion of the technical studies.
To ensure safe, secure and cost-effective lifecycle management of our nuclear materials.

**Strategy 2021, p58**

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**PLUTONIUM**

- To ensure the safe and secure management of separated plutonium held by the NDA and to work with the UK government to develop a long-term solution.

**Strategy 2021, p60**

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In 2021, work continues to provide the capability and capacity to treat and store plutonium at Sellafield.

---

**Quantities produced**

- Opening stock 2005: 104 te
- Produced: 38 te
- Total: 142 te

**Consolidation**

- Consolidated: 2
- Still to consolidate: 0
- Total: 2

**Repacking**

- Repacked: 0
- Still to repack: 141
- Total: 141

**Interim storage**

- Current inventory: 0
- Still to store: 141
- Estimated total: 141

**Reuse/Disposal**

- Volume disposed: 1
- Still to be reused or disposed: 141
- Estimated total: 142

---

When the NDA was established, 104 tonnes of plutonium had already been produced from reprocessing. Plutonium production will complete when Magnox reprocessing finishes which is likely to be in 2022.

The NDA took the decision to consolidate all plutonium in new storage at Sellafield and this consolidation is now complete. The plutonium inventory will however need repacking into long-term storage containers.

Our aim is to gradually transfer all plutonium into the most modern facilities over the next few decades (2019). To ensure that the plutonium packages can be safely stored in SPRS, they will be repackaged and, where appropriate, some plutonium will be treated to stabilise it for long-term storage.

A major new facility to repackage materials is required to support this strategy. This facility will repackage and, where appropriate, repack all of the plutonium packages and is currently being constructed.

Some older packages are to be repackaged in existing plants to ensure their safe management in the short to medium term.

Following repacking, all containers will be stored in the Sellafield Product and Residue Stores pending a decision on future management. New store capacity will be required to achieve the outcome.

The plutonium disposition reflects plutonium that was made into MOX fuel in the Sellafield MOX Plant, before the plant closed in 2011, and returned to overseas customers for use in their Light Water Reactors.
Nuclear Materials

To ensure safe, secure and cost-effective lifecycle management of our nuclear materials. Strategy 2021, p58

ESTIMATED LIFETIME INVENTORY - 2005 TO MISSION END

<table>
<thead>
<tr>
<th>Uranium</th>
<th>Opening stock</th>
<th>Produced</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>54,000 te</td>
<td>7,000 te</td>
<td>61,000 te</td>
</tr>
</tbody>
</table>

URANIUM - To continue safe and secure storage of our uranium inventory, to support its reuse where cost-effective and to ensure its final disposition. Strategy 2021, p63

In 2021, work continues to complete reprocessing and consolidate uranics at Capenhurst.

**Quantities produced**

- **6,000** quantity produced 2021
- **7,000** still to be produced

**Consolidation**

- **12,000** consolidated 2021
- **3,000** still to consolidate

**Treatment**

- **1,000** treated 2021
- **26,000** still to treat

**Interim storage**

- **34,000** inventory in interim storage 2021
- **26,000** still to store

**Re-use/Disposal**

- **60,000** estimated total
- **1,000** re-used/disposed 2021

A small quantity of uranium remains to be produced from Magnox fuel reprocessing at Sellafield.

The NDA has consolidated the majority of uranium stock at Capenhurst. Work is underway to consolidate the remaining quantity of uranium from Magnox fuel reprocessing from Sellafield, as well as a relatively small quantity of uranium from Dounreay, Magnox sites and Springfields to Capenhurst.

Uranium hexafluoride (HEX) is a chemically hazardous by-product of the uranium enrichment. The NDA is seeking to put in place the capability to re-package 26,000tU of HEX at Capenhurst. After repackaging the HEX will be treated to remove the chemical hazard, so that it can be interim stored pending re-use/disposal.

Uranium (NDA-owned and NDA customer material) will be interim stored at Capenhurst and Sellafield until it can be re-used or a decision is taken to dispose of it.

**Outputs**

- **80% COMPLETE**
- **56% COMPLETE**
- **1% COMPLETE**

Please note: Previously NDA reported against uranium that was owned by the NDA, produced from enrichment or reprocessing. The NDA also manages uranium on behalf of customers, and this has now been included with the exception of customer owned reprocessed uranium at Sellafield.
**WHAT IS INTEGRATED WASTE MANAGEMENT?**

Large quantities of diverse radioactive waste have been produced since the 1950s, and will continue to arise for decades to come. Managing these radioactive wastes, along with conventional waste, is one of the NDA’s biggest challenges.

**HOW ARE THE WASTES MANAGED?**

Wastes are characterised, treated appropriately as informed by radioactivity levels and handling requirements, before being packaged for long-term storage and/or transport and disposal. LLW is disposed of and higher activity waste is stored pending development of a final disposal route.

**WHAT HAS HAPPENED SINCE 2005?**

Since 2005 considerable progress has been made with the safe management of HLW and we are now getting towards the end of our vitrification programme of treating bulk liquid HLW. In addition, retrievals of ILW from legacy facilities has commenced, as we now prepare ourselves for continuous operations in this highest priority area. The NDA has taken the decision to consolidate some 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 Low Level Waste Repository (LLWR). We are now moving to a risk-informed strategy where radioactive wastes are managed according to the nature of the waste (radiological, physical and chemical) rather than simply the radioactive waste category they fall into.

**WHAT HAS TO HAPPEN NEXT?**

Reprocessing spent fuel, which produces highly radioactive liquid waste, was due to end in 2020 and this has been impacted by the COVID-19 pandemic, although it’s not currently anticipated that this will have a significant impact on the completion of HLW productions. We are constructing new waste treatment plants as required and again these have been impacted by the pandemic. Permanent disposal facilities must be constructed for all higher activity waste. The NDA’s risk-informed radioactive waste strategy also presents the opportunity to explore near-surface disposal for some of the ILW inventory.

---

### Low Level Waste

<table>
<thead>
<tr>
<th>Type</th>
<th>Raw Waste</th>
<th>Packaged Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLWR</td>
<td>4,092,000m³</td>
<td>342,000m³</td>
</tr>
</tbody>
</table>

### Intermediate Level Waste

<table>
<thead>
<tr>
<th>Type</th>
<th>Raw Waste</th>
<th>Packaged Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>ILWR</td>
<td>192,000m³</td>
<td>471,000m³</td>
</tr>
</tbody>
</table>

### High Level Waste

<table>
<thead>
<tr>
<th>Type</th>
<th>Raw Waste</th>
<th>Packaged Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLWR</td>
<td>4,000m³</td>
<td>1,650m³</td>
</tr>
</tbody>
</table>

---

**Estimates of Lifetime Inventory to Dispose - 2005 to Mission End**

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Raw Waste</th>
<th>Packaged Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLWR</td>
<td>4,092,000m³</td>
<td>342,000m³</td>
</tr>
<tr>
<td>ILWR</td>
<td>192,000m³</td>
<td>471,000m³</td>
</tr>
<tr>
<td>HLWR</td>
<td>4,000m³</td>
<td>1,650m³</td>
</tr>
</tbody>
</table>

---

**Strategic Outcomes - steps to achieving our mission**

<table>
<thead>
<tr>
<th>Outcome Description</th>
<th>Progress up to 2021</th>
<th>End Date</th>
<th>Mission End</th>
</tr>
</thead>
<tbody>
<tr>
<td>All LLW produced</td>
<td>7%</td>
<td>2127</td>
<td></td>
</tr>
<tr>
<td>All HLW produced</td>
<td></td>
<td>2025</td>
<td></td>
</tr>
<tr>
<td>All ILW retrieved</td>
<td>8%</td>
<td>2048</td>
<td></td>
</tr>
<tr>
<td>All ILW treated</td>
<td>9%</td>
<td>2120</td>
<td></td>
</tr>
<tr>
<td>All HLW treated</td>
<td></td>
<td>2030</td>
<td></td>
</tr>
<tr>
<td>All ILW in interim storage</td>
<td>15%</td>
<td>2120</td>
<td></td>
</tr>
<tr>
<td>All waste suitable for permanent landfill disposed</td>
<td>4%</td>
<td>2127</td>
<td></td>
</tr>
<tr>
<td>All ILW dispersed</td>
<td>0%</td>
<td>2125*</td>
<td></td>
</tr>
<tr>
<td>All ILW in interim storage</td>
<td></td>
<td>2030</td>
<td></td>
</tr>
<tr>
<td>All overseas HLW exported</td>
<td></td>
<td>2025</td>
<td></td>
</tr>
<tr>
<td>All HLW disposed</td>
<td></td>
<td>2104</td>
<td></td>
</tr>
</tbody>
</table>

*Note: The policy for Scotland is to have near surface management, 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 2021, p68

LOW LEVEL WASTE

To manage radioactive waste and dispose of it where possible, or place it in safe, secure and suitable storage, ensuring that we implement the policies of UK government and the devolved administrations - Strategy 2021, p72

In 2021, work continues to divert LLW away from the Low Level Waste Repository prolonging the life of the facility.

Quantities produced

<table>
<thead>
<tr>
<th>(raw waste vol.m³)</th>
<th>288,000</th>
<th>3,804,000</th>
<th>4,092,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>quantities produced</td>
<td>estimated to be produced</td>
<td>estimated total</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>7% COMPLETE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LLW produced from NDA operations and decommissioning

All LLW produced by 2127

All LLW treated - to enable diversion or reuse by 2127

National and NDA Strategy promotes the application of the Waste Hierarchy to LLW management to ensure that the group makes the best use of available disposal capacity. Waste diversion performance on NDA sites was high in 2020/21, 3,000m³ of waste being diverted with cross group diversion rates >65% indicating that application of the Waste Hierarchy is business-as-usual across the NDA group.

Diversion

<table>
<thead>
<tr>
<th>(raw waste vol.m³)</th>
<th>59,000</th>
<th>659,000</th>
<th>718,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>diverted</td>
<td>estimated still to divert</td>
<td>estimated total</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>3% COMPLETE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Diversion capabilities include - metal treatment and incineration

Disposal (NDA Facilities)

<table>
<thead>
<tr>
<th>(packaged waste vol.m³)</th>
<th>48,000</th>
<th>294,000</th>
<th>342,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLW disposed</td>
<td>LLW estimated still to dispose</td>
<td>estimated total</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>14% COMPLETE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

x2 sites Low Level Waste Repository and Dounreay

All waste suitable for disposal in NDA facilities by 2127

Solid LLW is disposed of at 2 facilities - the Low Level Waste Repository (the UK’s primary LLW disposal facility) and the Dounreay on-site disposal facility (which only manages waste arisings from Dounreay). LLW disposal rates in the NDA group slowed in 2020/21 owing to operational pauses as a result of the COVID-19 pandemic; although the LLWR remained operational to support non-NDA group disposals.

Disposal (Landfill)

<table>
<thead>
<tr>
<th>(imported vol.m³)</th>
<th>123,000</th>
<th>2,958,000</th>
<th>3,081,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLLW disposed</td>
<td>VLLW estimated still to dispose</td>
<td>estimated total</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>4% COMPLETE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

VLLW is the lowest hazard LLW, mainly consisting of soils, spoil and rubble. Known as Very Low Level Waste (VLLW), it’s principally disposed of at appropriately permitted landfill sites and some on-site facilities in the NDA group. Good progress on managing VLLW arisings has been maintained during 2020/21, with successful management of ~5,000m³.

Outputs

Inventory

Capability

Strategic Outcome

LLW and VLLW (a sub category of LLW) are produced from the maintenance, operation and decommissioning of facilities across the NDA group; and are reported as aggregated totals here for the first time. These wastes are the largest volume radioactive waste arisings in the NDA group, but account for only 0.0001% of the overall radioactivity.

All VLLW disposed of by 2129

All waste suitable for disposal in NDA facilities by 2127

All waste suitable for permitted landfill disposed by 2127

National and NDA Strategy promotes the application of the Waste Hierarchy to LLW management to ensure that the group makes the best use of available disposal capacity. Waste diversion performance on NDA sites was high in 2020/21, 3,000m³ of waste being diverted with cross group diversion rates >65% indicating that application of the Waste Hierarchy is business-as-usual across the NDA group.

Diversion

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Diversion capabilities include - metal treatment and incineration

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<td></td>
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<td>estimated total</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>4% COMPLETE</td>
<td></td>
<td></td>
</tr>
</tbody>
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**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 2021, p68

**INTERMEDIATE LEVEL WASTE**

- To manage radioactive waste and dispose of it where possible, or place it in safe, secure and suitable storage, ensuring that we implement the policies of UK government and the devolved administrations - Strategy 2021, p72

**Quantities produced**

<table>
<thead>
<tr>
<th>Raw waste vol.m³</th>
<th>2021</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total estimated</td>
<td>167,000</td>
<td>1,800</td>
</tr>
<tr>
<td>Total still to be produced</td>
<td>112,000</td>
<td>0</td>
</tr>
<tr>
<td>Total retrieved since 2005</td>
<td>55,000</td>
<td>1,800</td>
</tr>
</tbody>
</table>

**Legacy ponds & silos**

<table>
<thead>
<tr>
<th>Raw waste vol.m³</th>
<th>2021</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total estimated</td>
<td>21,300</td>
<td>19,500</td>
</tr>
<tr>
<td>Total still to retrieve</td>
<td>21,300</td>
<td>0</td>
</tr>
<tr>
<td>Total retrieved</td>
<td>1,800</td>
<td>1,800</td>
</tr>
</tbody>
</table>

**Treatment**

<table>
<thead>
<tr>
<th>Raw waste vol.m³</th>
<th>2021</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total estimated</td>
<td>192,000</td>
<td>174,000</td>
</tr>
<tr>
<td>Total still to treat</td>
<td>18,000</td>
<td>0</td>
</tr>
<tr>
<td>Total treated</td>
<td>18,000</td>
<td>18,000</td>
</tr>
</tbody>
</table>

**Interim storage**

<table>
<thead>
<tr>
<th>Packaged waste vol.m³</th>
<th>2021</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total estimated</td>
<td>372,000</td>
<td>372,000</td>
</tr>
<tr>
<td>Total still to store</td>
<td>317,000</td>
<td>0</td>
</tr>
<tr>
<td>Total current inventory</td>
<td>55,000</td>
<td>55,000</td>
</tr>
</tbody>
</table>

**Disposal**

<table>
<thead>
<tr>
<th>Packaged waste vol.m³</th>
<th>2021</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total estimated</td>
<td>471,000</td>
<td>471,000</td>
</tr>
<tr>
<td>Total still to dispose</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**In 2021, ILW continues to be produced with a focus on retrieving waste from legacy ponds and silos.**

ILW - waste exceeding the upper boundary for LLW that is not significantly heat generating - takes a variety of forms including: redundant nuclear reactor components, reactor core graphite, sludges from radioactive liquid effluent treatment, redundant plant equipment and some building fabric. As the NDA group projects and programmes mature, the volume of ILW will fluctuate as we reduce uncertainty in the inventory.

The Sellafield legacy ponds and silos represent some of the most complex and difficult global decommissioning challenges; and are a key priority for the NDA group. Significant quantities of bulk fuel and solid ILW have been retrieved from the legacy ponds (Pile Fuel Storage Pond and First Generation Magnox Storage Pond); the quantity of ILW retrieved has increased to 8% - an increase of 200m³ during the year. Progress has been made on preparations for retrieval from the legacy silo facilities with installation of the 400t first silo emptying plant in Magnox Swarf Storage Silo and creation of new access to the Pile Fuel Cladding Silo.

Different forms of ILW are treated in different ways so they can be safely packaged and stored until a disposal facility is available. ILW treatment is ongoing using the many available treatment plants available across the NDA group and work is ongoing to design, build and commission the approximately 40 new treatment facilities that are needed to complete this important stage of the ILW lifecycle.

Retrieved, treated and packaged ILW undergoes safe storage until appropriate disposal facilities are available. 15% of the total packaged ILW to be produced over the lifetime of the NDA group is currently in safe storage. Further new stores - approximately 11 - will be required to enable safe storage of the remaining inventory at Sellafield and for NDA sites in Scotland.

Final disposal of ILW arisings from the NDA group is reliant on the availability of the right disposal facilities. The NDA group is working with UK Government, local communities, regulators and technical specialists to identify a site for and to construct a GDF for ILW arisings in England and Wales. The policy in Scotland is for near-site, near-surface management. Progress has been made with the first Community Working Groups for the GDF being established in the past year. The NDA is also working with English and Welsh Governments to decide whether some ILW may be suitable for near-surface disposal which - subject to national policy and community acceptance - has the potential to be implemented earlier than the GDF.

**Strategy 2021, p68**

**Strategy 2021, p72**

**Strategy 2021**
**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 2021, p68*

### HIGH LEVEL WASTE

- To manage radioactive waste and dispose of it where possible, or place it in safe, secure and suitable storage, ensuring that we implement the policies of UK government and the devolved administrations. *Strategy 2021, p72*

**ESTIMATED LIFETIME INVENTORY TO DISPOSE - 2005 TO MISSION END**

**High Level Waste**

- Raw waste: 4,000m³
- Packaged waste: 1,650m³

#### Quantities produced

- **Raw waste vol.m³**
  - 2,700 quantities produced
  - 1,300 still to produce
  - 4,000 total

- **2021: 85% COMPLETE**

- **Highly Active Storage Tanks**

- **2021: All HLW produced by 2030 (including post operational clean out)**

**Highly Active Liquor (HAL) is a highly radioactive by-product of nuclear fuel reprocessing at the Sellafield site. The liquor is concentrated through evaporation and is stored in specially engineered Highly Active Storage Tanks prior to treatment. 60m³ of HAL has been produced and managed through this process this year.**

**Treatment**

- **536 treated**
- **194 still to treat**
- **730 total**

- **2021: 73% COMPLETE**

- **Waste Vitrification Plant**

**HAL is converted into a solid form for storage and disposal through a process called vitrification. In this process, the liquor is mixed with crushed glass in a furnace to produce a solid, stable glass which is poured into stainless steel casks. An additional 1.5% of the total waste arisings has been vitrified over the past year.**

**Interim storage**

- **1,210 current inventory**
- **260 still to store**
- **1,470 estimated total**

- **2021: 85% COMPLETE**

- **Vitrified Product Store (VPS)**

**The vitrified High Level Waste is stored in a purpose-built store - the Sellafield Vitrified Product Store(s) - until a UK disposal facility for HLW becomes available. An additional 1% of the total arisings was transferred into storage in 2020/21.**

**Disposal/Export**

- **180 exported**
- **1,470 still to be exported or disposed**
- **1,650 estimated total**

- **2021: 11% COMPLETE**

- **NO FACILITY CURRENTLY EXISTS**
  - Geological Disposal Facility (GDF)

**UK HLW disposal is pending the availability of a deep GDF; and the NDA group is working with government, local communities, regulators and other stakeholders to make progress on delivering this essential capability. Sellafield earns revenue from the processing of spent fuel for overseas customers and waste from this reprocessing is returned to the customer in line with contractual requirements. During 2020/21, 30m³ of HLW was successfully returned to customers.**
Site Decommissioning and Remediation

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 pace of decommissioning and 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, earlier release of land and the potential for future employment opportunities when sites are released.

WHAT HAS TO HAPPEN NEXT?
In response to government’s proposal to amend primary legislation and enable more streamlined regulation during the final stages of decommissioning, the NDA is working with regulators, SLCs and other stakeholders on the optimal end state for each site. The NDA is also working with local authorities on their development plans, to ensure proposed end states and development plans are aligned.

OBJECTIVE
To decommission and remediate our designated sites, and release them for other uses - Strategy 2021, p26

STRATEGIC OUTCOMES - steps to achieving our mission

OPERATIONAL AND PLANNED
- All planned new buildings operational (TBD) - 2090
- All buildings primary function completed (35%) - 2127

DECOMMISSIONING AND DEMOLITION
- All buildings decommissioned (18%) - 2131
- All buildings demolished or reused (16%) - 2133

SITES
- All land deicensed or relicensed (9%) - 2135
- All land in End State - all planned physical work complete (41%) - 2134
- All land demonstrated as suitable for reuse (9%) - 2135
- All land de-designated or reused (9%) - 2333
Site Decommissioning and Remediation

To decommission and remediate our designated sites, and release them for other uses. Strategy 2021, p26

DECOMMISSIONING (radioactive buildings) - To deliver site end states as soon as reasonably practicable with a progressive reduction of risk and hazard. Strategy 2021, p32

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

A nuclear installation is generally comprised of a number of buildings. When they are near the end of their operational life, a phase of work begins to transition it from operations to decommissioning. This phase normally starts well before operations finish and removes most of the nuclear hazard. New installations are still to be built to support the decommissioning mission, for example to package and temporarily store waste and ultimately, these will be decommissioned once their operational life is complete.

In line with Government strategy, NDA strategy is for installations to be decommissioned immediately after cessation of operations. Sometimes however a decision might be taken to defer decommissioning of a particular installation in order, for example, to realise benefits such as radioactive decay or to manage a constraint (e.g. restricted access, a lack of waste management infrastructure or limited resources).

The final part of decommissioning is demolition which 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.

DECOMMISSIONING

- To deliver site end states as soon as reasonably practicable with a progressive reduction of risk and hazard. Strategy 2021, p32

Operational and planned

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>New builds</td>
<td>Total</td>
<td>Remains</td>
</tr>
<tr>
<td>116</td>
<td>763</td>
<td>464</td>
</tr>
<tr>
<td>completed primary function since 2005</td>
<td>in post operational clean out</td>
<td>in decommissioning (decontamination and dismantling)</td>
</tr>
<tr>
<td>35% COMPLETED PRIMARY FUNCTION</td>
<td>18% COMPLETED DECOMMISSIONING</td>
<td></td>
</tr>
<tr>
<td>All planned new buildings operational by 2090</td>
<td>All buildings decommissioned by 2131</td>
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Demolition or reuse

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<tbody>
<tr>
<td>Total</td>
<td>Available for demolition or re-purposing</td>
<td>Demolished or re-purposed since 2005</td>
</tr>
<tr>
<td>244</td>
<td>18</td>
<td>219</td>
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</table>

Estimated lifetime inventory - 2005 to mission end

- Buildings (radioactive)

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<tbody>
<tr>
<td>Lifetime stock</td>
<td>New builds</td>
<td>Total</td>
</tr>
<tr>
<td>1,227</td>
<td>116</td>
<td>1,343</td>
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</table>

Strategic decision

Demolition work at Dungeness

Demolition work at Harwell

Turbine hall demolitions
Site Decommissioning and Remediation

LAND QUALITY MANAGEMENT AND LAND USE (sites) - To optimise the reuse of NDA sites. Strategy 2021, p44

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.

Each NDA site operates under a Nuclear Site Licence granted to the relevant Site Licence Company by the Office for Nuclear Regulation (ONR). The ‘de-licensing’ or ‘re-licensing’ activity needs to take place before land can be ‘de-designated’ and put to another use.

The NDA continues to support UK government’s proposal to amend the legislative framework that applies to nuclear sites and enable more streamlined regulation during the final stages of decommissioning and clean-up. The proposed amendment would enable site operators to optimise end states on a site by site basis. With this in mind, the NDA is working with regulators, SLCs and other stakeholders on the optimal end state for each site. The NDA is also working with local authorities to ensure that site end states and statements on the next planned use of sites are consistent with local waste and development plans.

In 2005, the NDA was given responsibility for land, under a ‘designating’ order by the Secretary of State. ‘De-designating’ this order signifies that the NDA’s mission is complete. We have utilised new software which can now more accurately measure the areas from our maps. Parts of Berkeley are now a college campus while land at Harwell and Winfrith has been developed as business parks. The last land to be de-designated was 3 hectares at Winfrith in Feb 2019.

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**

- Total licensed land: 1,043
- Total de/relicensed land: 93
- Total land de-designated: 93
- Total land to be characterised: 525
- Total land demonstrated as suitable for reuse: 93

**Opening stock 2005**

- 1,043* hectares
- 1,031 licensed & designated
- 12 Dounreay LLW facility

**Land (hectares)**

<table>
<thead>
<tr>
<th>Description</th>
<th>2021</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>De-designated or reused land</td>
<td>93</td>
<td>0</td>
</tr>
<tr>
<td>Total still to be de-designated or reuse</td>
<td>950</td>
<td></td>
</tr>
</tbody>
</table>

**Strategic Outcome**

- To optimise the reuse of NDA sites. Strategy 2021, p44

**Inventory**

- licences & designated land:
- total licensed land: 1,031
- total de/relicensed land: 93
- total land de-designated: 93
- total land to be characterised: 525
- total land demonstrated as suitable for reuse: 93

**2021**

- 9% LAND WHERE CHARACTERISATION IS COMPLETE SINCE 2005
- 49% LAND WHERE PHYSICAL WORK IS COMPLETE SINCE 2005
- 9% LAND DEMONSTRATED AS SUITABLE FOR REUSE SINCE 2005

**2021**

- All land de-designated or reused by 2133
- All land in End State - all planned physical work complete by 2134
- All land demonstrated as suitable for reuse

**Opening stock 2005**

- 1,043* hectares
- 1,031 licensed & designated
- 12 Dounreay LLW facility

**Opening stock 2005**

- The 1,043 hectares of land consists of 1,031 hectares of licensed and designated land and 12 hectares of land adjacent to the Dounreay nuclear licensed site that is used for the Dounreay LLW facility. Once all LLW has been removed from the Dounreay site the vaults will be sealed and the surface restored. The LLW facility site will then be monitored for 300 years, by which time 95% of the radioactivity will have decayed.

**Land (hectares)**

<table>
<thead>
<tr>
<th>Description</th>
<th>2021</th>
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</thead>
<tbody>
<tr>
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<td>0</td>
</tr>
<tr>
<td>Still to be de-designated/reused</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,043</td>
<td></td>
</tr>
</tbody>
</table>

**Bradwell in care and maintenance**

**Harwell**

**Winfirth**