

Exotic Fuels, Nuclear Materials and Waste Management – RSRL Harwell

Credible & Preferred Options (Gates A & B)

August 2011

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Executive Summary

An opportunity has been identified to transfer some spent fuel, nuclear material and waste from Harwell to Sellafield (and potentially Springfields for part of the inventory) where their future management is aligned to existing plans for similar materials. Such a transfer would improve value for money whilst maximising usage of existing Nuclear Decommissioning Authority (NDA) assets. Additionally, the transfer of materials to Sellafield will enable a reduction of the security category of the Harwell site.

This paper demonstrates that there is a strategic and economic case for the NDA management option for Dragon fuel, low-enriched uranium, contact-handled intermediate level waste drums and concrete lined drums to be changed from management at Harwell to management at Sellafield.

Work still needs to be completed by the Site Licence Companies (SLCs) to deliver the final business case to the NDA to confirm this view, or otherwise, so a decision can be made to implement the selected strategy for management of Research Site Restoration Limited (RSRL) fuel and material. This credible and preferred options paper has been published as one document to ensure that stakeholders are given the fullest amount of time to consider the options and submit comments to NDA.

Whilst the SLC prepares the final business case, NDA will engage with stakeholders and local communities through this credible and preferred options paper to gain their views of the proposed strategy for management of these materials. Stakeholders can submit comments for consideration, and comments will be taken into account when preparing the final paper for the NDA Board.

It is anticipated that the final business case will be presented in autumn 2011 and that a decision by NDA will follow within two months of receipt. Should management of RSRL fuel and material at Sellafield become the approved strategy, transportation will commence during 2013.

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1 Background

1.1 Project Objective

There are several strategic objectives within NDA Strategy¹ which are relevant in the consideration of the management of Harwell fuels, nuclear materials and wastes. In particular, the NDA's Exotics Fuels strategy states "we will ensure the continued safe management of these fuels, maximising opportunities to use existing facilities where value to the UK taxpayer can be secured. This may involve consolidating material at one or more locations for storage and treatment, and storage may be needed for several decades".

An opportunity has been identified to transfer some spent fuel, nuclear material and waste from Harwell to Sellafield (and potentially Springfields for part of the inventory) where their future management is aligned to existing plans for larger quantities of similar materials. Such a transfer would maximise the usage of existing NDA assets and additionally enable the reduction of the security category of the Harwell site.

Of all the spent fuel, nuclear material and waste currently stored on the Harwell site, only a relatively small volume requires special security measures. Transfer of such material off the Harwell site to another suitably secure site would therefore reduce the security category of the Harwell site. Such a change to the security category of the site would lead to substantially lower security costs over the remaining life of the site.

1.2 Harwell Fuel, Nuclear Materials and Wastes

There are many different forms of spent fuel, nuclear material and waste that are currently stored safely and securely on the Harwell site. Examples include decommissioning Intermediate Level Waste (ILW) and Low Level Waste (LLW), GLEEP fuel, and low-enriched uranium.

Of the spent fuel, nuclear material and waste at Harwell, only four types are considered to merit a higher security classification:

- Dragon fuel;
- Low-Enriched Uranium (LEU); and
- Contact-handled Intermediate Level Waste (ILW) drums, and concrete-lined drums.

This study only addresses these materials and the management arrangements for the other materials on the site are dealt with under the NDA's Integrated Waste Management strategic theme.

¹ NDA Strategy, April 2011

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1.3 What is Dragon Fuel?

The Dragon reactor was a 20 MW high-temperature helium-cooled experimental reactor located at Winfrith, and was operated from June 1965 to September 1975.

The properties of the Dragon reactor spent fuel vary significantly from other commercial and experimental fuels. It was originally placed into mild steel spent fuel canisters and stored in the Dragon Fuel Store at Winfrith. The fuel was repackaged into stainless steel containers before it was transferred from Winfrith to Harwell between 2002 and 2004, where it is currently stored dry. As a result there is extensive experience of transporting the fuel.

The fuel was heavily irradiated, has a high fissile inventory and was designed to be difficult to reprocess.

1.4 What is Low-Enriched Uranium (LEU)?

Naturally occurring uranium (known as natural uranium) principally contains two uranium isotopes, ^{235}U and ^{238}U at 0.7% and 99.3% concentrations respectively. Low-enriched uranium (LEU) is the term used to describe uranium that has been modified to increase the level of ^{235}U in the uranium to the concentration range of 0.7% to 19.99%. The LEU at Harwell is very lightly irradiated uranium dioxide (and therefore can be handled), and is stored in the form of drummed pellets and powders with a very small amount of uranium metal. The LEU was previously transferred from Winfrith to Harwell in 2004 and suitable transport containers exist to support future movements.

There are several tonnes of LEU at Harwell.

1.5 What are concrete-lined drums?

Concrete-lined drums are steel drums lined with concrete for increased shielding. The drums contain either plutonium contaminated material or miscellaneous beta/gamma (β/γ) waste. There are over 2000 containers at Harwell in either 200, 450 or 670 litre drums.

1.6 What are contact-handled Intermediate Level Waste (CHILW) drums?

There are several types of contact-handled Intermediate Level Waste (ILW) drums which contain ILW for which the level of radioactivity means that they can be handled without the need for special remote operations. Some of these contact-handled ILW drums contain plutonium contaminated material. At Harwell there are several thousand contact-handled ILW steel 200-litre drums.

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1.7 Hazard Potential and Reduction?

The safety and environmental detriment of hazards on nuclear sites can be measured using the Safety and Environmental Detriment (SED) score, where a high number indicates a high hazard. The highest SED score at Harwell is remote-handled ILW which is currently being packed into 500-litre drums, and this dominates the site SED score until the repacking is finished. Once repackaged they will not merit a high security category and, hence, are not considered as part of the scope of this study.

The concrete-lined drums constitute the next highest SED score largely due to their current storage conditions, so if they are transferred to improved storage conditions, the SED score for the concrete-lined drums will decrease significantly.

The SED score for the contact-handled ILW drums is much lower but together the contact-handled ILW drums and concrete-lined drums make up two thirds of the volume of ILW at Harwell.

Despite its inventory, Dragon fuel has a relatively low SED score due to the nature of the material, robust containers and the secure facility in which it is stored.

2 Strategic Case

2.1 Existing Situation

The current strategy for Dragon fuel, drummed contact-handled ILW, concrete-lined drums and LEU is to process them on the Harwell site for long-term interim storage prior to transfer to the Geological Disposal Facility.

The Head End Cell in the Solid Waste Complex at Harwell is currently used to re-pack legacy remote handled ILW into 500-litre drums. When this work is complete, the current plan is to modify the Head End Cell to accept the Dragon fuel in its existing containers and pack each of them into a 500-litre drum. The space in the drum would be filled with a cement grout in the Harwell Waste Encapsulation Plant.

For contact-handled ILW drums and concrete-lined drums the current strategy is to modify an existing facility to accommodate a new processing plant. The contact-handled ILW drums will be grouted with cement and the waste inside the concrete-lined drums will be grouted with polymer. Both products will be stored in a new purpose-built store (Harwell ILW Store) until the Geological Disposal Facility is available. Prior to export, the grouted 200-litre drums and concrete-lined drums will be over-packed into 3m³ or 2m boxes depending on the fissile content of the drums and the space between the drums filled with cement. The final disposal volume is estimated to be over 5,000m³.

The LEU will be transferred to the Harwell ILW Store in its current containers for long-term interim storage. Prior to export to the Geological Disposal Facility, the LEU

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will be repacked into 500-litre drums and grouted with cement. The contribution to the site SED score from the LEU is very small.

Harwell is currently policed by the Civil Nuclear Constabulary as appropriate to the security classification of the site. The current baseline plan assumes the Civil Nuclear Constabulary will remain on site until all the ILW stored at Harwell is transferred to the Geological Disposal Facility around 2060.

2.2 Business Needs

The primary business objective for this programme is to develop the opportunity to improve value for money whilst utilising existing NDA estate-wide assets to more appropriately manage security sensitive material. This would have the additional benefit of reducing the security category of the Harwell site by removal of waste and nuclear material that contributes to the security requirements, while not increasing the security category of the anticipated receiving site(s). This will enable the Harwell site to be patrolled by a contract guard force rather than the Civil Nuclear Constabulary, as at present, resulting in a reduction of security costs for the Harwell site.

2.3 Critical Success Factors

The critical success factors for this programme are:

- The identified waste and nuclear material must be removed from the Harwell site and a small number of large sources packaged and grouted, enabling the security category to be reduced.
- The transfer of waste and nuclear material must not compromise the planned hazard reduction programme at any impacted sites.
- Strategies for processing the Dragon fuel, drummed contact-handled ILW, concrete-lined drums and LEU must be similar or better in terms of cost, hazard reduction and environmental benefit to those originally planned at Harwell, whilst representing improved value for money for the NDA and the UK taxpayer. Please refer to Section 3 of this paper for further information on the economic case.
- Proven means of transporting the material must exist with minimal additional processing required at Harwell.

2.4 Investment Objectives

The investment objective for this programme is to manage security sensitive material currently located on the Harwell site using the most appropriate NDA estate-wide assets without adversely impacting receiving sites, reduce the long term costs for operating the Harwell site and to expedite the reduction of hazard from the site.

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This will be achieved by removal of the Dragon fuel, drummed contact-handled ILW, concrete-lined drums and LEU from the Harwell site so that the security requirements and associated costs can be reduced. This will:

- Enable the Harwell site to be patrolled by a contract guard force rather than the Civil Nuclear Constabulary resulting in reduced security costs.
- Allow Dragon fuel, drummed contact-handled ILW and concrete-lined drums to be processed using facilities and stores already in existence or planned (for similar usage) at another site rather than building new facilities and storage at Harwell.
- Avoid the requirement to build new facilities or modify existing facilities to process the material at Harwell and significantly reduce the scope of the new store currently planned in the Harwell lifetime plan.
- Continue to allow opportunities for the recovery and re-use of the LEU to be explored.

2.5 Dependencies

The benefits realisation of reduced security is dependent on completion of a major part of the Harwell lifetime plan which includes the repacking of remote-handled ILW into approved containers for storage in a purpose built shielded store. The key constraints to this programme are the priorities of hazard reduction and meeting regulatory commitments.

2.6 Options Analysis and Results


For the purpose of considering management options, the materials have been split into three categories: (i) Dragon fuel, (ii) LEU, and (iii) contact-handled ILW and concrete-lined drums.

Several options have been investigated and analysed for each of the three categories of fuel, nuclear material and waste. The decision categories shown in the tables below are defined in Appendix 1.

The options have been considered against the critical success factors and the wider NDA value framework and compared to the Harwell baseline. The results are summarised below.

2.6.1 Dragon Fuel

Dragon fuel is heavily irradiated with a high fissile inventory; therefore there are no facilities outside of Sellafield that can readily accept this material. As the fuel was designed to be difficult to reprocess, it will eventually need to be disposed of as waste. The Dragon fuel was transferred from Winfrith to Harwell between 2002 and 2004 and suitable transport containers are available to support future movements. Based on these criteria, the options for Dragon fuel are:




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1. Leave at Harwell, grout into 500-litre drums and store prior to disposal;
2. Transfer to Sellafield:
 - 2a. Transport flask to the Wastes Encapsulation Plant and then to the Magnox Encapsulation Plant for processing;
 - 2b. Transport flask to process immediately through the Wastes Encapsulation Plant;
 - 2c. Transfer to Sellafield, store, then process through the Box Encapsulation Plant; or
3. Transfer to Dounreay.

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Option Analysis for Dragon Fuel		
Option	Decision	Reasons
1	(Baseline) Contingent (on-site)	<ul style="list-style-type: none"> Does not deliver critical success factor in relation to the NDA's Strategy objectives and in relation to reduction in security requirements at Harwell.
2a	Preferred (Magnox Encapsulation Plant)	<ul style="list-style-type: none"> Plant already exists therefore no additional build required; Does not increase the relative hazard at Sellafield and removes material 25 years earlier from Harwell; Material can be imported using the same modular flask used for previous transfers of material from Winfrith to Harwell; Plant has capacity and availability and produces the same product as would be produced at Harwell, so the disposability risks are the same; The product is compatible with the Encapsulated Product Store; Environmental impacts are similar in processing at Harwell but slight impact due to increase in road transport; This option represents improved value for money against the current baseline.
2b	Contingent (Wastes Encapsulation Plant)	<ul style="list-style-type: none"> Analysis as above for Magnox Encapsulation Plant; Plant is similar to Magnox Encapsulation Plant but heavily utilised by the Sellafield site; The modular flask would have to be modified to import into Wastes Encapsulation Plant; Importing the material would be more difficult than Magnox Encapsulation Plant.
2c	Dormant (Box Encapsulation Plant)	<ul style="list-style-type: none"> The plant is not designed or built; There would not be an immediate hazard reduction at Sellafield; Fuel would need to be stored prior to processing.
3	Reject	<ul style="list-style-type: none"> No suitable facility available for storage or treatment; and Does not deliver critical success factor in relation to overall hazard and security classification reduction at Dounreay.



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2.6.2 *Low Enriched Uranium (LEU)*

The LEU is very lightly irradiated uranium dioxide in the form of drummed pellets and powders with a small amount of uranium metal. The LEU was transferred from Winfrith to Harwell in 2004 and suitable transport containers exist to support future movements. The options for LEU are:

1. Leave the LEU at Harwell, grout into 500-litre drums and dispose to the Geological Disposal Facility;
2. Transfer LEU to Sellafield and store in the THORP Uranium Store pending future management e.g. reuse. If reuse is not possible, condition for disposal at a later time with other similar material;
3. Transfer to Capenhurst for storage with other Category III materials;
4. Transfer to Springfields for recycling;
5. Transfer to Springfields for down blending and then storage at Capenhurst;
6. Sell LEU on the open market; or
7. Transfer to Dounreay for storage and eventual immobilisation and disposal

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Option Analysis for Low Enriched Uranium (LEU)		
Option	Decision	Reasons
1	(Baseline) Contingent (on-site)	<ul style="list-style-type: none"> Does not deliver critical success factor in relation to reduction in security requirements at Harwell; Will generate very large volumes of product for disposal and therefore poor environmental performance.
2	Preferred (Thorp Uranium Store)	<ul style="list-style-type: none"> THORP Uranium Store has the necessary capacity, although it doesn't currently store uranium at the higher enrichment levels; Does not increase hazard at Sellafield and removes material 25 years earlier from Harwell; Marginal impact on the quantity of material for possible disposal; Does not foreclose other options for recycling or resale and maintains material enrichment; Environmental impacts are similar to processing at Harwell if disposal to the Geological Disposal Facility is assumed but slight safety detriment due to increase in road transport; This option represents improved value for money against the current baseline.
3	Dormant (Capenhurst)	<ul style="list-style-type: none"> Capenhurst has similar material at present but would require upgrades to stores if the LEU is stored long-term; There may be increased security costs if the LEU is stored long-term; LEU may dominate the site hazard profile if stored long-term, depending on assumed conditions of storage; This is not a complete answer, but could provide a short-term solution.
4	Contingent (Springfields)	<ul style="list-style-type: none"> LEU is potentially suitable for recycling through Springfields' facilities, but without additional characterisation it cannot be demonstrated that this will result in a saleable product; Springfields cannot accept material unless there is a defined export strategy, so a sale of the material must be agreed before the material is shipped off-site to a customer.
5	Dormant (Springfields/ Capenhurst)	<ul style="list-style-type: none"> LEU is potentially suitable for recycling following down-blending. If the LEU was down-blended, it would be no more hazardous than other material stored at Capenhurst and would have no impact on security

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Option Analysis for Low Enriched Uranium (LEU)		
		<p>arrangements;</p> <ul style="list-style-type: none"> • If the LEU was down-blended and converted, it would be similar to other materials at Capenhurst, but overall package volumes would increase as a result of conversion to U³⁰⁸; • Material could have a low economic value and be disposed of with other materials at Capenhurst.
6	Contingent (sell)	<ul style="list-style-type: none"> • Because it is enriched, the LEU has an economic value. However, the market is limited since the LEU is very lightly irradiated; • Sale of the material would only considered if a buyer could be found, and if the sale would result in a lower net cost to NDA than options and is politically acceptable.
7	Reject (Dounreay)	<ul style="list-style-type: none"> • Would compromise hazard reduction activities at Dounreay; • Would face considerable regulatory and policy challenges.

2.6.3 Contact-handled ILW drums and concrete-lined drums

The majority of the waste within the contact-handled ILW drums and concrete-lined drums is contaminated with plutonium; therefore Sellafield and Dounreay are the only other NDA sites that can potentially handle this material. Sending this waste to Dounreay would compromise hazard reduction activities there and would face considerable regulatory and policy challenges, so the only credible alternative is Sellafield which already has larger quantities of similar materials.

Sellafield Ltd has recently undertaken a similar process of relocating plutonium contaminated material from LLWR to Sellafield and the transport infrastructure is in place although some relicensing would be required. RSRL has also been through a similar process to consolidate contact-handled ILW from Winfrith to Harwell. Based on this the options are:

1. Leave at Harwell, grout the 200-litre contact-handled ILW drums with cement and store long-term prior to overpacking into 3m³ boxes for disposal at the Geological Disposal Facility. Grout the inner waste containers in the concrete-lined drums with polymer and store long-term prior to overpacking into 3m³ or 2m boxes for disposal.
2. Transfer the contact-handled ILW drums to the Engineered Drum Store and the concrete-lined drums to a new store at Sellafield. Process the super-compactable drums through the Sellafield Waste Treatment Complex into 500-litre drums for long-term storage. Contact-handled ILW drums are not suitable for super-compaction and

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the concrete-lined drums would be stored until they could be processed in the planned Waste Treatment Complex 2.

Option Analysis for contact-handled ILW drums and concrete-lined drums		
Option	Decision	Reasons
1	(Baseline) Contingent (on-site)	<ul style="list-style-type: none"> • Does not deliver critical success factor in relation to reduction in security requirements at Harwell; • Will require construction of cement / polymer grouting facilities; • Will require construction of larger, long-term storage facility
2	Preferred (Waste Treatment Complex & Crate Breakdown Facility)	<ul style="list-style-type: none"> • Plant already exists or is planned so there is no additional build and negligible impact on Sellafield plutonium contaminated material strategy; • Does not increase relative hazard at Sellafield and removes material 25 years earlier from Harwell; • Material import routes exist including transport containers and handling systems at Sellafield; • Better environmental performance as new build is avoided and Waste Treatment Complex can super-compact a significant proportion of the existing drums; • Slight safety impact due to additional road transport; • Significant opportunity for volume reduction; • Waste can be segregated into ILW and LLW for non-compactable contact-handled ILW drums and concrete-lined drums processed through the planned Crate Breakdown Facility; • This option represents improved value for money against the current baseline.

2.7 Preferred Option Summary

The NDA's preferred options, identified above, are not currently being implemented. Implementation of the preferred option that the NDA considers best meets the business need is subject to further discussion with stakeholders and regulators prior to any formal strategy approval. The engagement with stakeholders takes place through this paper, and any comments can be sent to the NDA on strategy@nda.gov.uk.

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The preferred options can be summarised as management at Sellafield as opposed to the baseline (management at Harwell) or other credible options (management at other sites). In summary:

- The preferred management option for Dragon fuel is transfer to Sellafield and process through the Magnox Encapsulation Plant for long-term storage in the Encapsulated Product Store.
- The preferred management option for LEU is to transfer it to Sellafield and store in the THORP Uranium Store pending future potential reuse. If reuse is not possible, condition for disposal at a later time with other similar material.

The preferred management option for contact-handled ILW and concrete-lined drums is to transfer them to Sellafield and process through the Sellafield Waste Treatment Complex into 500-litre drums for long-term storage. Contact-handled ILW drums are not suitable for super-compaction and the concrete-lined drums would be stored until they could be processed in the planned Crate Breakdown Facility.

Should these preferred options become the NDA's approved strategy, a number of transportations between Harwell and Sellafield would be required. The preferred mode of transportation is a mixture of road and rail, dependent upon schedule – with multiple loads by rail and single loads by road. A railhead close to Harwell has been identified and Direct Rail Services (DRS) would be responsible for moving the packages prepared at Harwell to the train.

3 Economic Case

3.1 Hazard Reduction

As discussed in section 1.7, the NDA's preferred option would have an overall positive benefit to NDA estate hazard reduction, as the material would be converted to a wasteform and stored in facilities that yield a lower SED score over a shorter time compared to the current plan.

3.2 Cost

The lifecycle costs for the combined preferred viable options compared to the 2011/12 baselines are as follows:

	2011/12 MV
Total Lifetime costs savings for RSRL	£247M
Total extra lifetime costs for Sellafield	£100M
Overall lifetime savings for NDA	£147M

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These costs will be subject to economic discounting.

3.3 Value Framework Analysis

A comparison of the preferred option of sending all the materials under consideration to Sellafield and the baseline option of continued management at Harwell has been carried out against the NDA's Value Framework. The following table is a summary of the value framework analysis.

Attribute	Transfer to Sellafield (preferred option)	Management at Harwell (current baseline)
Hazard Reduction	<ul style="list-style-type: none"> • SED of material is many orders of magnitude less than that existing at Sellafield. There will be no noticeable difference in Sellafield SED score. • Provides earlier hazard reduction for Dragon fuel (processing to be completed in 2017). 	<ul style="list-style-type: none"> • Retention at Harwell means that no hazard reduction of Dragon fuel is possible until the material is processed in 2025. • Concrete-lined drum and contact-handled ILW drums make up two-thirds of Harwell's hazard baseline. • Concrete-lined drums have a relatively high SED score on the site due to current storage conditions. Hazard reduction cannot be addressed until a new ILW store is built. • Dragon fuel SED score is in the same order as contact-handled ILW drums. • LEU has a low SED score.
Security	<ul style="list-style-type: none"> • Nuclear material stored with similar protected material at Sellafield. • Reduced security risk by transferring nuclear material to a site with an enhanced security regime, which will be retained until at least 2060. 	<ul style="list-style-type: none"> • Harwell would continue to be policed by the Civil Nuclear Constabulary as appropriate to the quantity of fissile material at the site, until material is transferred to the Geological Disposal Facility around 2062. • Physical security requirements would need to be maintained at a level appropriate for these materials until around 2060 (the date for disposal in the Geological Disposal Facility).

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Attribute	Transfer to Sellafield (preferred option)	Management at Harwell (current baseline)
Safety	<ul style="list-style-type: none"> • There would be a slight short-term safety detriment due to the increase in off-site movements. However, the strategy of using rail transport where possible will minimise any increase. • Dragon fuel, LEU and contact-handled ILW could be processed and stored in existing plants with minimal plant modifications required. • A new store for concrete-lined drums may need to be built. • All Harwell waste forms would feed into existing treatment programmes for Sellafield derived waste for final disposal to the Geological Disposal Facility. 	<ul style="list-style-type: none"> • Retention at Harwell would require significantly larger new ILW Stores to be built, and will extend the time that special nuclear material is stored unprocessed in existing stores. • Dragon fuel would require modification of the Head End Cell to process the fuel into 500-litre drums for final disposal to the Geological Disposal Facility. • Contact-handled ILW and concrete-lined drums would require a new processing plant to fill the drums with grout for final disposal to the Geological Disposal Facility.
Environment	<ul style="list-style-type: none"> • In order to receive Dragon fuel, the Magnox Encapsulation Plant would need relatively minor modification to its Single Drum Export Station in order to transfer containers from the Retrievals Flask to the Export Station but processing facilities are already in place. • Contact-handled ILW drums would be stored in a modern facility already used to store plutonium contaminated material. • An opportunity exists for approximately 50% of the contact-handled ILW drums to be super compacted in the Waste Treatment Complex, resulting in 25% reduction in the additional storage volume being taken up in the Engineered Drum Store. • A new store for concrete-lined drums may need to be built. • There will be a slight 	<ul style="list-style-type: none"> • Environment detriment due to the transport and materials required to build new facilities and modify existing facilities. • Dragon fuel would need a major modification to the Head End Cell in the Solid Waste Complex to accept Dragon fuel and process it into 500-litre drums. • Contact-handled ILW and concrete-lined drums would require a new processing plant to fill the drums with grout with no reduction in material volume. • The disposal volume of the Dragon fuel would be similar whether it was processed and stored at Harwell or Sellafield. • New ILW Store at Harwell will be larger and more complex to accommodate contact-handled ILW and concrete-lined drums.

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Attribute	Transfer to Sellafield (preferred option)	Management at Harwell (current baseline)
	environmental detriment due to the transfer of material packages by rail transportation from Harwell to Sellafield.	
Socio-economic	<ul style="list-style-type: none"> • No significant difference between options. • Sellafield 'business' would increase and extra resources for processing material would be required. • Transfer of special nuclear material would support earlier release of development land at the Harwell Site which may provide socio-economic opportunities associated with the Harwell Science and Innovation Campus. 	<ul style="list-style-type: none"> • No significant difference between options. • Retention of material at Harwell would require continued resources for processing and Civil Nuclear Constabulary resources for security.
Cost	<ul style="list-style-type: none"> • Overall lifetime saving to NDA of £147M at 2011/12 MV. 	<ul style="list-style-type: none"> • Current Harwell lifetime cost of £262M at 2011/12 MV.

3.4 Sensitivity

Of the three categories of fuel, waste and nuclear material, the alternative option for Dragon fuel comprises the highest risk. If Dragon fuel cannot be received and processed in the Magnox Encapsulation Plant at Sellafield, the alternatives are much less favourable. Dragon fuel could, however, also be processed through the Waste Encapsulation Plant, thus providing a contingency.

If the Dragon fuel cannot be transferred off-site then the current security arrangements at Harwell would remain and the cost savings would be reduced. However, the reduced savings from dealing with the other materials would still outweigh the cost of transportation and processing at Sellafield.

4 Commercial Case

Delivery of the work scope will be through the RSRL and Sellafield contracts but will also require transportation support from other organisations such as International Nuclear Services (INS) and DRS to support flask transfers.

RSRL and Sellafield will own the work scope and will co-operate on a shared endeavour to deliver the overall work programme.

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5 Financial Case

A full financial case is being prepared and the impact on site funding is well understood. This is a contractual matter between the NDA and the SLCs and will not be published here.

A more detailed financial case will be delivered in the presentation of the final business case by the SLCs to NDA.

6 Management Case

The programme and project management arrangements have been considered. The successful delivery of the project requires close working between Harwell and Sellafield and management of the interfaces with DRS and INS.


To ensure success, clear accountabilities and interface arrangements have been identified:

- A joint Project Board has been established with senior representatives from RSRL and Sellafield. NDA are represented on the board;
- A Single Point of Accountability has been identified for each site reporting to the Project Board;
- There will be site specific project teams for Sellafield and Harwell. These teams will report to the site Single Point of Accountability;
- RSRL accountability is up to delivery of transport packages to Sellafield including leading the interface with INS, DRS and Department for Transport (DfT); and
- Sellafield accountability is from receipt of loaded transport packages to export of empty transport packages loaded with appropriate furniture where necessary.

7 Summary and Conclusions

NDA has studied the high level options associated with the management of Dragon fuel, low-enriched uranium, contact-handled intermediate level waste drums and concrete lined drums currently stored at Harwell. This paper describes and discusses the relevant factors associated with each high-level option, and draws conclusions based on the analysis.

This consideration has shown that there is a strategic and economic case for the NDA management option for Dragon fuel, LEU, contact-handled ILW drums and concrete-lined drums to be changed from management at Harwell to management at Sellafield.



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Work still needs to be completed by the SLCs to deliver the final business case to the NDA to confirm this view, or otherwise, so a decision can be made to implement the selected strategy.

In preparing the final business case, the SLCs and NDA will engage with stakeholders and local communities through this Credible and Preferred Options paper, and will take account of any comments received in the final case submitted to the NDA Board. Stakeholder comments may be submitted to strategy@nda.gov.uk.

It is anticipated that the final business case will be presented in autumn 2011 and that a decision by NDA will follow within two months of receipt. Should management of Harwell based materials at Sellafield become the approved strategy, transportation will commence during 2013.

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8 Appendix 1

Definitions of Decision Categories

Decision	Definition
Preferred option	The option that NDA will further develop prior to a final decision to implement it.
Contingent option	<p>An option which warrants further development in case the preferred option turns out to be undeliverable.</p> <p>In the document, the current baseline is always shown as a “contingent” option because it is an acceptable, if sub-optimal, option.</p>
Dormant option	Dormant options represent potential options but which do not need further development at this time.
Rejected option	Rejected options will not be developed further.