

The Role of the National Low Level Waste Repository in Delivering New Solutions for the Management of Low Level Wastes in the UK - 9215

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ABSTRACT

The UK National Low Level Waste Repository (LLWR) is located near to the village of Drigg in West Cumbria. It is the principal site for disposal of solid Low Level Radioactive Waste (LLW) in the United Kingdom.

This paper describes the program of work currently being undertaken by the site's operators, (LLW Repository Ltd and its newly appointed Parent Body Organisation), to extend the life of the LLWR and reduce the overall cost of LLW management to the UK taxpayer.

The current focus of this program is to prevent disposal capacity being taken up at LLWR by waste types which lend themselves to alternative treatment and/or disposition routes.

The chosen approach enables consignors to segregate LLW at source into formats which allow further treatment for volume reduction or, (for wastes with lower levels of activity), consignment in the future to alternative disposal facilities. Segregation of waste will initially be incentivised through pricing mechanisms incorporated into LLW Disposal agreements between the LLWR operator and waste consignors.

INTRODUCTION

The LLWR is located approximately four miles from the Sellafield (formerly Windscales) nuclear complex in West Cumbria. The location of the LLWR was chosen due to its proximity to Sellafield site – Sellafield is the main UK consignor of LLW, historically and for the foreseeable future.

The LLWR was constructed on the site of a World War II munitions factory. Disposal of LLW commenced in 1959, initially using a series of shallow trenches cut into the glacial clay layer beneath the site.

As waste management standards changed over time, the methods of disposal at the LLWR developed and improved. From the mid 1990's waste has been consigned for disposal in steel ISO containers which are filled with a cement based grout, prior to emplacement in a shallow vault - a multi barrier containment structure with integral leachate collection system.

The facility has operated on a commercial basis since the formation of British Nuclear Fuels Ltd (BNFL) in 1971.

With the arrival of the UK Nuclear Decommissioning Authority (NDA) in 2004, the LLWR's pivotal role in enabling the accelerated remediation of the UK's nuclear legacy and its importance to non NDA (and non nuclear) waste consignors was recognised.

In Quarter 1 2008, NDA awarded the contract for the Management and Operation of the LLWR to UK Nuclear Waste Management Ltd (UKNWM Ltd) – a consortium led by; URS Corporation - Washington Division and including Studsvik UK Ltd, Areva and Serco Assurance. The LLWR thus became the first NDA site M&O contract to be awarded under open competition, as required by the Energy Act 2004.

On 1 April 2008, the new Management and Operation contract came into effect with the sale of all shares in the LLW Repository Ltd Site Licence Company from British Nuclear Group Plc to UKNWM Ltd. This action transfers ownership of the Site Licence Company (SLC) to its new Parent Body Organisation (PBO).

The team at the LLWR has two main objectives:-

- Maintaining a safe, reliable and cost effective disposal capability at the LLWR Site
- Reducing the cost of LLW management liabilities to the UK taxpayer

The site itself has two significant issues:-

- Disposal capacity (in volumetric terms) at the LLWR site is limited. There is insufficient capacity at the site to meet the future needs of UK consignors
- The Environmental Safety Case (ESC) supporting the use of the site as a final disposal solution is still under development

With the support and guidance of its new PBO and management team, LLW Repository Ltd is focusing its efforts on:-

- Delivering the ESC in the timescales required by the Regulator
- Building new storage and disposal capacity at the site
- Transforming LLW Management practices in the UK to ensure that capacity is used effectively

This final point is the main topic of this paper.

The Storage Capacity Issue

Planning approval was granted in June 2008 for the construction of a new vault at the LLWR. This new facility - 'Vault 9' - will provide approximately 100,000m³ of additional capacity. However, analysis of the latest UK Radioactive Waste inventory[1] forecast waste arisings (Fig.1) indicate that a potential capacity gap of 1.7 million m³ exists.

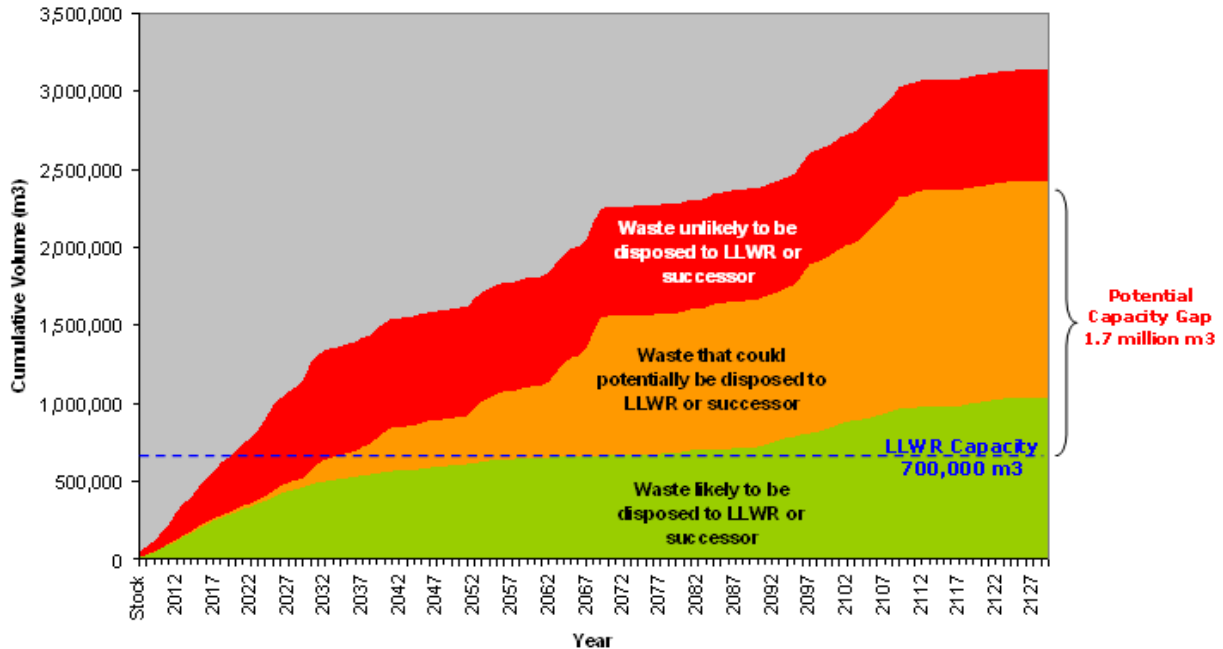


Fig. 1 Cumulative LLW Arisings (UK Radioactive Waste Inventory 2007)

The identification of this capacity gap represents the major challenge for the UK’s LLW management plans. The potential cost, schedule and stakeholder issues raised by the potential loss of LLW disposal capability are critical.

There are numerous opportunities arising from analysis of the UK inventory to reduce or eliminate significant volumes of material currently planned for disposal at the LLWR. In the long term, a fully optimised, UK-wide Strategy for LLW management will be developed and implemented to meet the needs of waste producers in the nuclear and non-nuclear sectors. The steps being taken to deliver the UK strategy are described in the final section of this paper.

In the short term, however, it is recognised by waste producers, stakeholders, regulators and NDA that early solutions must be developed and delivered to begin optimising the use of LLWR capacity as soon as possible. These early solutions – described by LLW Repository Ltd as ‘Innovation Projects’ – are intended to establish alternative routes and avoid consigning material for vault disposal where other options are available.

Addressing the Storage Capacity Issue

In addition to the provision of additional vault capacity through the construction of Vault 9, our initial approach to addressing the capacity gap is focused on specific innovations and can be summarised thus:-

Objective:- reduce the volume of material being consigned for disposal at the LLWR

Innovation Projects in summary:-

- Introduce (optional) ‘segregated waste services’ – incentivising consignors to segregate the ‘treatable’ waste, i.e. metallic and combustible material prior to consignment to the LLWR.
- Open up routes from the LLWR to treatment providers such that segregated waste is treated and residues returned for disposal.
- Divert waste which fits into the definition of High Volume Very Low Level Waste[2] from general LLW such that it can be routed to suitably licensed alternative facilities.
- Develop improved packaging solutions to optimise the use of disposal capacity.

The introduction of segregated waste services began in October 2008. These services are offered as an option to consignors (with an interim pricing mechanism to encourage take up).

A preliminary assessment of the opportunity presented by each innovation is shown in Fig. 2

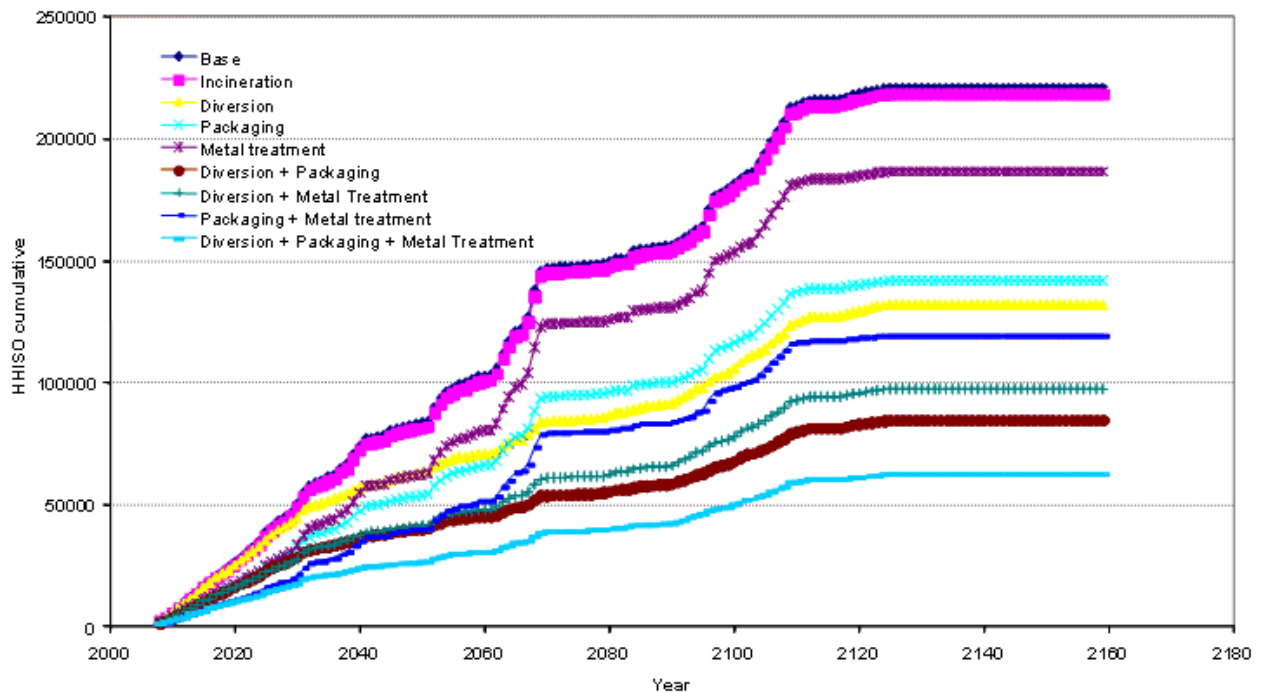


Fig. 2 Analysis of Opportunities Arising from Innovation projects [3]

Further validation of this model is being carried out as information is developed on the effectiveness of the innovation projects.

The following sections describe the challenges and steps taken to implement the innovation projects

CONTRACTUAL AND TECHNICAL CHALLENGES

Disposal Contract

In order for a producer of LLW to consign waste to the LLWR, they must enter into a commercial agreement with LLW Repository Ltd. The terms and conditions of this agreement are embodied in a low level waste disposal contract between the two parties. LLW Repository Ltd currently holds twenty eight contracts with a range of organisations. LLWR is the only NDA facility with a multi-site remit and

provides services to all NDA sites and additionally to nuclear and non-nuclear organisations in the Public, Private and Defence sectors of the UK. A model contract has been established for each sector.

The disposal contract is an important feature in the implementation of the innovation projects as it is this agreement that contains both the Conditions for Acceptance for LLW Repository Ltd's range of services and the price to be paid by the customer. Establishing the right contractual arrangements will have a significant impact on the effectiveness of the new range of services.

The Conditions for Acceptance (CfA) for the Low Level Waste Repository are contained within the LLW disposal contract. The CfA defines the ranges and limits of material which can be accepted for disposal. The physical, chemical and radiological properties of the raw waste are stated, along with information on the procedures to be followed for consignment. The inclusion of the CfA in the contract is intended to provide reassurance to customers that they will not be changed without consultation and agreement through an amendment to the contract.

Enhanced Services

Traditionally, LLW Repository Ltd has focussed its service offering on the disposal of LLW with the addition of limited treatment services. It has offered the following services:

- Disposal Container Supply Service
- Loose Waste Compaction Service
- Drummed Waste Compaction Service
- Low Level Waste Disposal Service

The innovation projects will enhance the range of services that LLW Repository Ltd offers to include greater focus on the treatment of waste prior to disposal and ensuring that waste is disposed of to the most appropriate facility. In the future, LLW Repository Ltd will offer the following additional services:

- Transport Container Supply Service
- Metallic Waste Treatment Service
- Combustible Waste Treatment Service
- Very Low Level Waste Disposal Service
- Characterisation and Analysis Services
- Customer Support and Technical Services

The disposal contract will be developed accordingly to support the expansion of the range of services LLW Repository Ltd provides. In October 2008, LLW Repository Ltd, through consultation with customers, introduced an amendment to the current contracts that allowed the introduction of the Metallic Waste, Combustible Waste and Very Low Level Waste services. The amendment included new sections within the CfA to address the requirements for the three new waste types. It also introduced a pricing structure for the new services. This structure is aligned to the waste hierarchy to ensure that customers are encouraged to use treatment services to minimise waste volumes prior to disposal.

The current contracts are due to be renewed in 2009 and LLW Repository Ltd is undertaking a fundamental review of the existing arrangements including the CfA to ensure that the new contracts will fully support the implementation of the innovation projects. The intention of the review is to make sure that the contracts and the CfA are customer friendly and influence the right behaviours by encouraging and supporting customer's waste management activities. Consultation with customers will be taking place in Q1 2009 with a new model contract being established during Q2 2009.

Pricing

The development of a long term pricing structure for LLW Repository Ltd's services is a challenging task. The introduction of treatment services can represent additional expenditure in the short term when compared with disposal prices. However, the long term benefit of increased treatment is a reduction in the volume to be disposed and this is the primary solution to the storage capacity issue and the avoidance of significant costs associated with the provision of additional disposal facilities.

LLW Repository Ltd has tried to encourage the application of the waste management hierarchy through the introduction of incentivised pricing structures. Customers have been encouraged to use treatment services over disposal services and also to increase the volume utilisation of the disposal container. This approach has proved successful during the initial introduction of new approaches.

In the longer term, the incentivised pricing structures may not be directly sustainable for certain treatment services. By acting as a central service provider, LLW Repository Ltd will be able to aggregate demand for treatment services and obtain best value from the supply chain by providing a consistent supply of material. In addition, the standardised supported approach to accessing the services will reduce setup costs for customers and impact on the overall cost of providing treatment services. It is this approach that LLW Repository Ltd will use to ensure that the price of services is optimised.

The new contract to be introduced in 2009 will include the provision of a long term pricing approach for LLW Repository Ltd's services. This will support customers in their decision making processes when assessing the best waste management options for LLW.

Consignor Support

In addition to the development of new contracts, LLW Repository Ltd is enhancing its organization in the area of customer support. The Consignor Support Team was established in late to 2008 to provide a single source of support to customers. This team includes project management, technical and commercial resources that have been brought together from existing teams within LLW Repository Ltd. The creation of the Consignor Support Team will support the implementation of the innovation projects by providing direct support to customers with the development of new treatment options at their facilities.

The suite of innovation projects to be implemented includes improvements to the IT systems used to manage the waste acceptance process. LLW Repository Ltd is looking to introduce a web based management system to improve the consignment approval process. In addition, the characterisation and assessment requirements for wastes will be standardised to improve the segregation of wastes and the application of the waste hierarchy to ensure waste is managed in the most appropriate way.

As shown in Figure 3, within the Consignor Support Team, there are three key organisational areas:

- Service Development
- Service Delivery
- Service Assurance

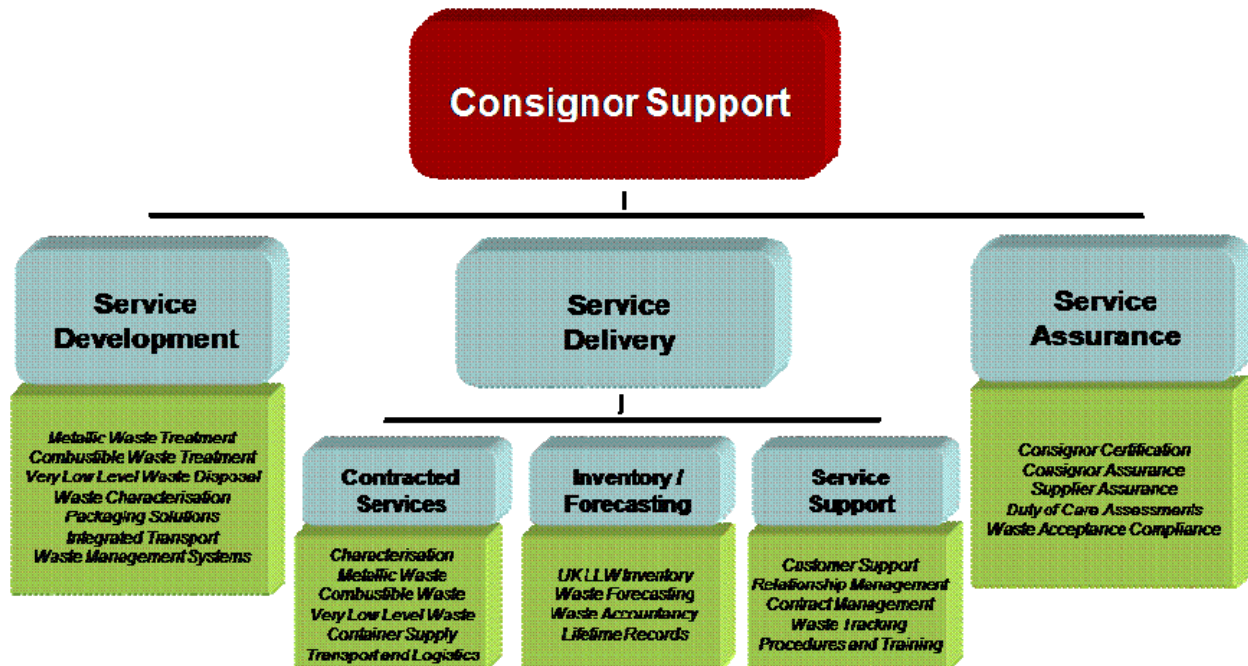


Fig. 3 The Consignor Support Team Organisation

The Service Development Team will focus on the establishment of the new services. This will include the procurement of services from the supply chain, the development of new Authorisations to allow shipment in the UK and abroad. The Team will also develop the arrangements for providing services including the development of Conditions for Acceptance and any supporting systems. The Team will also support new business development activities and the identification of new service opportunities.

The Service Delivery Team will focus on the day to day provision of services to customers. Primarily this will be support to the application of the CfA and helping customers implement new segregated waste approaches at their facilities. The Team will also provide the interface with service suppliers managing the day to day logistics of shipping waste for treatment including waste tracking. The Team has an important role to play in enhancing the UK's inventory of low level waste. This is a key tool in the development of new services and ensuring sufficient capacity is provided for the disposal of LLW.

The Service Assurance Team will provide the audit function for the Consignor Support organisation. This will include both customer and supplier assurance programmes. A key feature of introducing new treatment and disposal services is ensuring that Duty of Care requirements are met. The Team will also lead the Waste Receipt Monitoring programme for LLW Repository Ltd. This programme is a requirement under the Disposal Authorisation to confirm that waste received at the Repository complies with the CfA.

This structure is aimed at providing a single set of co-ordinated resources dedicated to the services LLW Repository Ltd provides to its customers. The activities to be undertaken during 2009 to improve the contractual arrangements and the processes to access LLW Repository Ltd's services will be key to the successful and effective implementation of the innovation projects.

REGULATORY AND COMMERCIAL CHALLENGES

Regulatory Issues

The transfer and disposal of LLW in the UK is authorised under the Radioactive Substances Act 1993, (RSA93). This legislation sets out the requirements and limitations associated with consignment of waste between sites and to the UK Low Level Waste Repository.

The body responsible for regulating authorised sites is the UK Environment Agency (EA). EA Inspectors have statutory powers to enforce compliance with the requirements of RSA93. In general, consigning sites are authorised to transfer material to the LLWR 'for the purpose of final disposal'.

LLW Repository Ltd has worked closely with EA to ensure that consignment of segregated waste to the LLWR prior to treatment is acceptable under existing authorisations, subject to discussion with the EA Inspectors responsible for the consignor site and the LLWR. However, it was recognised that ultimately, the current authorisations did not provide sufficient transparency – i.e. the fact that significant quantities of material would be consigned from the LLWR to external treatment providers, prior to final disposal of returned residues is not adequately reflected in the consigning sites authorisation.

Historically, in order to change the wording in an RSA93 authorisation, the consigning site would propose a variation to EA, who would then carry out the necessary consultation and issue a revised Certificate of Authorisation. This process requires time and effort on behalf of each consignor and needs to be aligned with any additional changes that the consignor may already be planning. Discussion between LLW Repository Ltd and EA concluded that the timescale for implementing changes across all UK consignors using this approach would be unacceptable.

To address this issue, EA have proposed that they will modify the standard wording related to transfer of LLW to the LLWR to ensure that the potential for subsequent transfer for treatment is clearly stated. This approach will be implemented as an administrative change by EA with no requirement for the consigning sites to take action.

The revised authorisations are expected to be enacted by Q1 2009 and are indicative of the ongoing commitment and support of EA in bringing about changes in waste management practice in the UK.

Transfer of material for treatment at facilities outside the UK (for example for metallic waste treatment in Europe or the USA) is authorised and regulated by the EA under separate legislation; The Transfrontier Shipment of Radioactive Waste Regulations 1993, (TFS).

Under this system, LLW Repository Ltd will seek approval for transfer of material and return of secondary wastes. Fig. 4 illustrates the regulatory framework for authorisation of waste transfer for treatment and disposal of metallic waste using facilities in the UK and abroad.

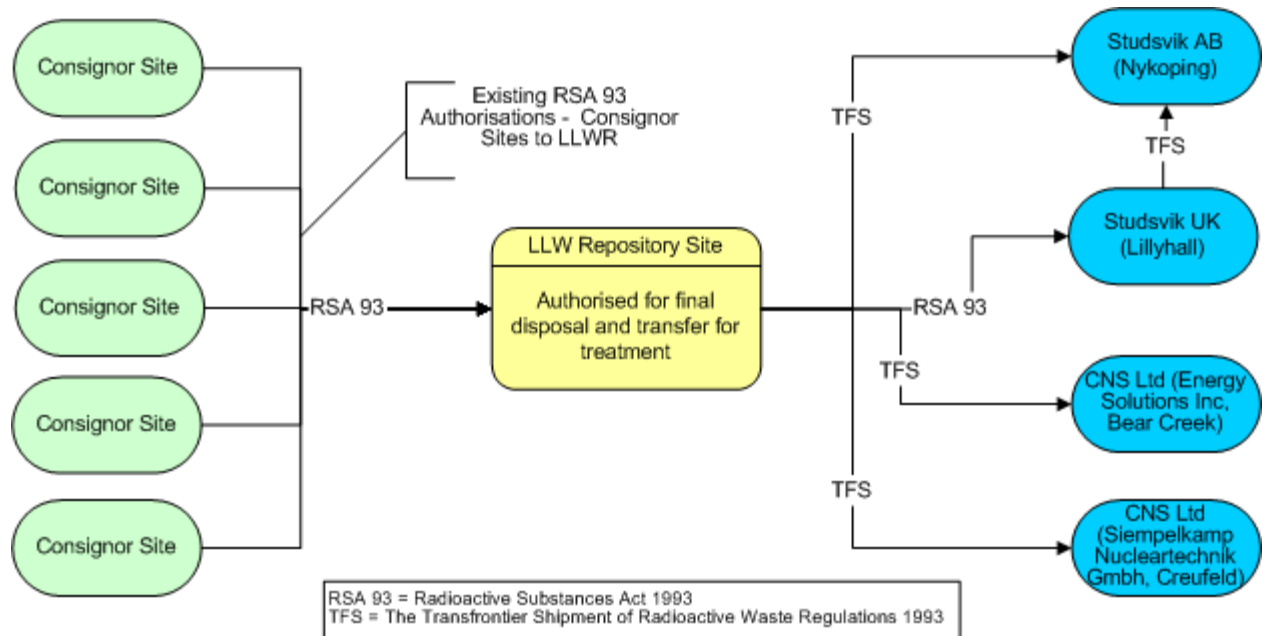


Fig. 4 Regulatory framework for authorising and regulating (using metallic waste treatment example).

When seeking either approval under RSA93 to establish a route to UK facilities or under TFS to send material for treatment outside the UK, LLW Repository Ltd must justify the approach chosen.

This justification is in the form of a Best Practicable Environmental Option (BPEO) study, supported by a report demonstrating that the chosen approach demonstrates the Best Practicable Means (BPM) to achieve the chosen option.

It should be noted that the central role of the LLWR in UK LLW management sets the context within which the BPEO is established. For example, an individual site may consider the recycling of metallic waste to be unfeasible in terms of affordability and practicality, especially if the volume of suitable material is limited. LLW Repository Ltd receives consignments from many sites. This gives rise to the opportunity to combine multiple consignments of material, store it, and then optimise transport and treatment thus minimising the final volume of material to be consigned for vault disposal. The BPEO for LLWR is therefore different to that of an individual consignor for the same material. These wider ranging study reports have been termed 'strategic' BPEO studies.

Currently, NDA and LLW Repository Ltd have completed strategic BPEO studies on metallic and combustible wastes. The strategic BPEO study on VLLW disposal at alternative facilities is underway.

The BPM case underpinning segregated metallic waste treatment has also been completed. Using these documents as a basis, LLW Repository Ltd has submitted an application to the EA for a variation to its authorisation under RSA93 to allow the transfer of metallic waste to the Studsvik UK Ltd facility currently under construction at Lillyhall, Workington (some 20 miles from the LLWR site).

Commercial Issues

When placing contracts for the supply of goods and services with the Supply Chain, LLW Repository Ltd is required to comply with NDA procurement and commercial requirements with regard to competitive tendering.

The selection of companies to provide waste treatment services to LLW Repository Ltd is therefore carried out on a competitive basis, utilising existing framework agreements as well as offering new opportunities to the market.

In each instance the contract strategy remains consistent, with LLW Repository Ltd seeking to; find and select suitable and experienced suppliers; deliver safe, reliable, timely treatment services and demonstrate value for money in the marketplace.

Where appropriate, requests for Expressions of Interest and Invitations to Tender have been published in the Official Journal of the European Union. Contracts are for a fixed duration and will be re-competed upon termination.

A full technical and commercial evaluation of the services offered by each company is undertaken by LLW Repository Ltd prior to the establishment of a Framework Contract for the provision of specific treatment services.

All contracts let by LLW Repository Ltd for the supply of treatment services are subject to NDA approval. The following table indicates the current status of the new services discussed earlier in this paper.

Table I. Commercial Status of Treatment Services

	Expression of Interest	Invitation to Tender	Framework Established	Request for Quotation	1st Contract Award
Metallic Waste	Complete	Complete	Complete	Complete	Complete
Combustible Waste	Complete	Complete	April 2009	July 2009	September 2009
VLLW Disposal	Complete	March 2009	August 2009	To Be Agreed	To Be Agreed

Whenever more than one company can provide a similar service as part of a framework, there may be overlap in the services supplied – i.e. it is anticipated that some of the material offered for treatment will be suitable for more than one supplier, resulting in a choice of potential treatment routes. On these occasions quotations will be evaluated on a commercial and program considerations.

However, it must also be considered that Supply Chain capability to deliver treatment services is bounded by several main factors;

- The Waste Acceptance Criteria (WAC) of the facilities involved.
- Transport regulations relating to carriage of nuclear material
- The requirement to avoid production of Intermediate Level Waste (ILW) through increased specific activity of the residues resulting from treatment

- The regulatory requirements surrounding the release of recycled metal into the supply chain, and/or demand for recycled material.

These factors can vary, depending upon capacity, time of year and process capability at any given time (some of the equipment used is operated on a 'campaign basis' and provides better or worse performance depending upon what stage of the campaign the plant has reached when the waste is introduced).

It must also be noted that the composition of the material to be treated will also vary widely in terms of physical properties and radionuclide content,

This degree of variability means that there will be occasions when one supplier or another cannot accept material which would under other circumstances be treatable, or vice versa

For the reasons described above, single bid or no bid situations may arise. In this situation the decision to re-offer the material at a later date or to dispose of the material directly to the vault as uncompactable waste will be at LLW Repository Ltd's sole discretion.

To mitigate this problem, LLW Repository Ltd will seek to encourage the development of treatment capability; we will be especially interested in proposals to further develop capability in the UK.

INTEGRATION WITH UK NATIONAL LLW STRATEGY

UK Government Policy[2] requires that NDA develop a UK-wide Strategy for LLW generated by the nuclear-industry. This is complementary to the NDA Strategy and Annual Plans, which will include LLW management and disposal strategy. The NDA's Strategy are approved by Government and will provide guidance for national, regional and local planning authorities, as necessary, in the preparation of planning strategies and their appraisal. A dedicated team from LLW Repository Ltd is working on behalf of NDA and its stakeholders to develop the LLW Strategy.

Formation of a group to integrate the national LLW programme was a key element of the UKNWM Ltd tender. The NDA has established a National LLW Strategy Group to develop a working partnership between NDA, LLWR, Regulators, Stakeholders and LLW consignors for promoting innovation, value for money, implementing the waste hierarchy, as well as planning for effective waste disposal solutions. The first meeting of the National LLW Strategy Group was held in April 2008 and subsequent meetings have been held in June, August and November 2008. These meetings have been used to consult and inform the development of the emerging LLW Strategy and associated underpinning deliverables.

The LLWR SLC is working in collaboration with NDA and consignors to develop LLW Topical Strategies, undertake strategic reviews, option and opportunities studies, and provide a comprehensive UK LLW Management Plan. In April 2008 NDA and LLWR published a number of Preliminary Topical Strategies for LLW Management to initiate the consultation process with consignors, regulators and other interested stakeholders that form the LLW Strategy Group. An important objective in development of these topical strategies was to provide assured waste storage and disposal capacity at the LLWR. The approach for solving the LLWR capacity gap was integrated with the approaches for applying the waste hierarchy at consignors' sites and opening up more fit-for-purpose disposal routes, consistent with revised UK LLW Policy.

The UK Low Level Waste Strategic Review

The Draft UK LLW Strategic Review, [3] issued in October 2008, represented a major milestone in development of the strategy. The Strategic Review includes the NDA's first comprehensive national LLW baseline integrating LLW strategies, infrastructure, volumes, and costs. The review identifies a number of synergies and opportunities to reduce NDA's LLW liabilities (in excess of £10 billion) by more than 10%. The review identified and prioritised 54 strategic initiatives to improve LLW management across the UK and reduce NDA's cost liabilities by several £billion. This Strategic Review will inform NDA's strategic decision-making and the development of the Nuclear Industry LLW Strategy and the associated National LLW Management Plan.

The responses from the Topical Strategy consultation were been used, in conjunction with the LLW Strategic Review, to further develop and mature the resultant LLW Topical Strategies. As a result, the LLW Topical Strategies issued in November 2008 provide high-level conclusions and recommendations to NDA to inform the development of UK nuclear industry LLW strategy and NDA Strategy.

NDA will be preparing the Nuclear Industry LLW Strategy and supporting Strategic Environmental Assessment (SEA) for public consultation by March 2009. Following consultation, the LLW Strategy will be updated and recommended to ministers for approval by December 2009. In parallel, LLWR are developing the National LLW Management Plan which will set out how the strategy will be implemented.

CONCLUSION

The innovation projects described above should be viewed as a first step towards a more integrated approach to LLW management in the UK. NDA has recognised that LLW Repository Ltd is in a unique position to integrate and optimise waste management practice by virtue of its national perspective on waste issues. One benefit of this national perspective is its ability to enable the case to be made for treatment options, based on aggregated wastestreams received from multiple sites. By demonstrating the industry's ability to establish new routes and arrangements we can help inform and define the optimum strategy for the management of LLW in the UK.

This approach is consistent with UK Government policy [2] in that it;

- Is consistent with the requirements of the waste management hierarchy.
- Provides an 'early solution' for LLW Repository Ltd and its customers to make the best use of the limited disposal capacity at the LLWR site.

LLW Repository Ltd is working with NDA, Regulators and Stakeholders to develop and implement the optimised UK National LLW Strategy. The LLW Strategy will form part of NDA's overall strategic approach to manage the UK's nuclear legacy. It will also ensure that LLW management and treatment facilities are available to LLW producers who are not part of the NDA estate.

Further optimisation and deployment of new services will be initiated through further discussion and consultation under the auspices of the National LLW Strategy Group. It is envisaged that the National LLW Strategy will identify and guide developments in;

- enhanced characterisation and segregation methods,
- requirements for local, regional and national infrastructure
- optimised transport and packaging solutions

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These developments are aimed at providing a sustainable, cost effective approach to LLW management in the United Kingdom.

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