A REPORT BY ENVIROS CONSULTING LIMITED: MAY 2007

# **BRITISH NUCLEAR GROUP**

BEST PRACTICABLE ENVIRONMENTAL OPTION FOR CARE AND MAINTENANCE PREPARATION WASTES AT CHAPELCROSS

Publication title	Best Practicable Environmental Option for Care and Maintenance Preparation Wastes at Chapelcross
CAN	BN0020023
Volume number	Volume 1 of 1
Version	Version 1.0
Date	May 2007
File Reference	BN0020023/Report

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# EXECUTIVE SUMMARY

A BPEO study was carried out to support the identification of appropriate management options for wastes arising during the 'care and maintenance' phase of decommissioning activities at Chapelcross Power Station.

Two main waste categories were considered

- Intermediate level radioactive waste (ILW);
- Low level radioactive waste (LLW);

The study applied a Best Practicable Environmental Option (BPEO) methodology to evaluate management options. The approach was designed to make use of currently readily available information, including the technical expertise and site knowledge of BNG staff, within the relatively limited time available for this work. This report presents the results of the study. The approach taken is consistent with the environment agencies guidance on the application of BPEO to radioactive waste management issues.

A number of treatment options were identified for specific types of waste in each waste category.

The treatment options were screened for compliance with UK law and international conventions where clearly defined and consistency with UK policy where clearly defined. The remaining options were then scored against a series of attributes in the following groups:

- Health and safety: attributes in this group reflect the confidence that an option could protect human health from both radiological and nonradiological impacts.
- Environmental impacts: attributes in this group reflect the assessment of the impact on air quality, water quality, land, visual impact, nuisances, energy usage, flora and fauna.
- Environmental objectives: attributes such as compliance with the waste hierarchy, the move towards 'concentrate and contain', minimisation of waste volumes and the rate of hazard reduction.
- **Technical performance**: attributes in this group address an option's ability to perform its planned function in terms of viability, nuclear safety, flexibility and programme.
- **Socio-economic**: attributes in this group are concerned with possible impacts to the local community (the immediate area surrounding Chapelcross) in terms of economy, and culture and heritage.
- Financial cost: attributes in this group include the undiscounted cost of implementing each option within the constraints and scope of this study and the reduction of the NDA's nuclear liabilities expressed in terms of the completeness of the solution.

Scoring of the options against the attributes was undertaken by a two stage process that involved individual scoring by BNG staff and collation and consolidation of individual scores to provide overall group scores, followed by collective discussion at an internal 'round-table' forum, drawing on the



specialist knowledge and practice experience of BNG staff, and facilitated by independent consultants.

The unweighted scores were then weighted in four different schemes to test the robustness of the outcomes. The four different weighting schemes were devised to test the outcome if an emphasis was put on such factors as costs and the environment. The highest scoring options for each waste group are as provided in the following table.

Waste category	Waste group	Highest scoring option		
ILW	Metals	Conditioning and interim storage		
	Ceramics	Conditioning and interim storage or Disposal at Sellafield		
	Sludges	Conditioning and interim storage		
	Resins	Conditioning and interim storage		
	Aggregate	Conditioning and interim storage		
	Magnox and graphite	Conditioning and interim storage or Disposal at Sellafield		
	Desiccants	Conditioning and interim storage		
	Oils and oily wastes	Conditioning and interim storage		
LLW	Metal	Decontaminate to SoLA levels		
	Asbestos	Disposal at the National LLW repository near Drigg		
	Aggregate	On-site disposal in a purpose-built facility		
	Cellulosic	On-site disposal in a purpose built facility		
	Plastic and rubber	Decontaminate to SoLA levels		
	Contaminated waste water	Discharge without treatment		
	Organic liquids	Off-site disposal by incineration (from previous specific BPEO study).		

It is important to consider this summary information in context; in some cases a relatively small number of options was considered and the differences between the scores may not be significant.



# 1. INTRODUCTION

### 1.1 Background

Chapelcross is the site of a four-reactor Magnox type power station, which was built on the site of a former RAF station. It is located 3 km north-east of the town of Annan in the Dumfries and Galloway region of south-west Scotland. It is situated 6 km from the coast of the Solway Firth and 13 km from the land border with England. Chapelcross was built and commissioned between 1955 and 1959. The cessation of electricity generation was formally announced on 29<sup>th</sup> June 2004.

Chapelcross is slightly different from most of the other Magnox power station sites: there are no active effluent treatment plants, the effluent discharge pipeline is 6 km long, there are no reactor vaults and the heat exchangers are external to the reactor buildings. In addition to these features of the power station, other unique features exist on the site e.g. the North Site, including the UO<sub>3</sub> store (B141) and the Production Plant (CXPP, which is a Ministry of Defence plant that processes neutron absorption cartridges that are removed from the reactors).

Initial decommissioning of the site is being undertaken in parallel with defuelling. Redundant plant and buildings are being removed or made safe, and waste materials are disposed of or will be placed in a safe condition and location for interim storage. This initial work will prepare the site for 'care and maintenance' where the reactor block and remaining wastes will be left in a safe state pending final site clearance. This work is planned to be completed in 2021.

# 1.2 Objectives and Scope

The purpose of the study was to support the identification of appropriate management options for the 'care and maintenance' preparations wastes. The study undertaken used a Best Practicable Environmental Option (BPEO) methodology.

The waste groups considered within the study were those arising from Care and Maintenance preparations:

- Intermediate Level Waste (ILW)<sup>1</sup> but also including that generated during the operational lifetime of the reactors
- Low Level Waste (LLW)<sup>2</sup>

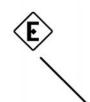
Consideration of non-radioactive waste streams was outside the scope of this project.

# 1.3 Strategic Considerations

The study was performed in order to:

<sup>&</sup>lt;sup>1</sup> Waste with radioactivity levels which exceed the upper boundary for low-level waste, but which does not generate significant amounts of heat.

<sup>&</sup>lt;sup>2</sup> Waste which contains radioactive materials which do not exceed 4 GBq/tonne alpha or 12 GBq/tonne beta/gamma activity.



- 1. Support a future submission by the site for a revised multi-media RSA application once the focus of operations changes from power generation to decommissioning; and
- 2. Inform the development of the Chapelcross's site's Integrated Waste Strategy.

The study applied a BPEO methodology to evaluate management options. The approach was designed to make the use of currently readily available information, including the technical expertise and site knowledge of BNG staff, within the relatively limited time available for this work. This report presents the results of the study. The approach taken is consistent with the environment agencies guidance on the application of BPEO to radioactive waste management issues.



# 2. THE BPEO METHODOLOGY

#### 2.1 General approach

The BPEO methodology is a formalised system for evaluating issues and their environmental implications and for determining appropriate options to address these issues. The system was first proposed by the Royal Commission on Environmental Pollution (RCEP) in the mid-1970's [RCEP, 1976] as a way to help control air pollution with the aim of diverting releases to the environmental medium where there is the least environmental impact.

The RCEP went on to define BPEO as follows in its Twelfth Report [RCEP, 1988]:

"... the outcome of a systematic and consultative decision-making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long term as well as in the short term."

Various definitions and suggested implementations of BPEO have since been published by Government bodies and advisory bodies [e.g. Department of Environment, 1986]. Most recently the Environment Agency (EA) and the Scottish Environment Protection Agency (SEPA) have published guidance on the application of BPEO to radioactive waste management [EA & SEPA, 2004]. The environment agencies and other regulators frequently require BPEO studies or appropriate option studies before approving projects.

The methodology applied in this study involves the following seven steps:

- Step 1: Definition of the objectives and scope of the study to provide a focus for the assessment and to help establish a basis for subsequent decision-making by setting out the primary boundary conditions.
- Step 2: Generation of a comprehensive list of management options to ensure that all reasonably practical or technical feasible options are included and the outcome is not pre-judged.
- Step 3: Initial screening of options to remove from consideration those options that are clearly non-viable (e.g. would contravene either UK law or international obligations).
- Step 4: Definition of a series of 'attributes' that are viewed to be important for determining the best option and which are relevant at the level of detail being considered.
- Step 5: Evaluation ('scoring') of the options against the attributes to allow them to be compared quantitatively.
- Step 6: Identification of the 'best' option(s) on the basis of the scoring results and using appropriate weighting schemes.
- Step 7: Analysis of the robustness of the 'best' options(s) to the weighting scheme employed in the scoring exercises, and other possible alternatives, through a sensitivity analysis.

The identification of the BPEO is an important input to strategic decision making. In practice, however, few decisions are made solely on the basis of such a study. The selection and approval of a preferred option may be modified by other factors that are not taken directly into account in the BPEO study. These other factors may include political considerations or the results of more detailed safety, economic and technical optimisation studies.

The objectives of the study were agreed at a meeting with British Nuclear Group to be to undertake a study that:

- results in a BPEO assessment that can be presented to SEPA;
- could be used to inform the site's integrated waste strategy (IWS);
- provides consistent links, as required, to the site's programme of best practicable means (BPM) studies; and
- enables the site to make best use of existing and future waste management routes, including those based on reuse and recycling, and clearance and exemption in line with the application of the waste hierarchy and the expectation of the regulators.

Enviros was commissioned by British Nuclear Group to support them by providing:

- facilitation at workshops;
- a multi-attribute decision analysis evaluation process; and,
- documentation of the study.

# 2.2 The approach at Chapelcross

The approach to the BPEO process at Chapelcross was to hold two workshops:

- The optioneering workshop
- The scoring workshop

Both workshops were attended by technical and expert staff from British Nuclear Group.

### 2.2.1 The optioneering workshop

The aim of optioneering workshop was to:

- confirm the materials assigned to each waste group
- draw-up a long-list of management options for each wastestream;
- draw-up a list of screening criteria;
- undertake a screening exercise to draw-up a short-list of options for more detailed assessment in the second round of assessments;



- draw-up an initial list of assessment criteria (attributes); and
- identify the information needs to enable the detailed assessment to be undertaken.

#### 2.2.2 The scoring workshop

The aim of this workshop was to review the scoring that had been carried out independently by site staff and to resolve any areas of discrepancy that were highlighted from an analysis of the scoring.

The independent scoring exercise was facilitated by the production of a briefing pack and instructions to individuals on how to undertake the scoring.

#### 2.2.3 Data and information

The BPEO requires input in terms of data and information. Due to the high level and wide ranging nature of the study, generic data were derived and used on the basis of expert input from BNG site staff.



# 3. BPEO ISSUES GENERIC TO ALL WASTE CATEGORIES

## 3.1 Identification of options

The study identified a range of waste management options for the waste categories and these are set out in detail for ILW in section 4 and for LLW in section 5.

The identification of potential options was undertaken collectively by internal staff in a 'round-table' forum made up of British Nuclear Group staff with a wide-range of specialist knowledge and practical experience with support from an independent environmental consultancy. The panel members are detailed in Appendix A.

# 3.2 Screening Priorities

The priorities used in this option study to define screening criteria relate to the following issues.

- Compliance with UK law and international conventions where clearly defined.
- Consistency with UK policy where clearly defined.

These issues are discussed in more detail below. Screening criteria are based on these main issues where a specific and definable requirement could be identified. It should be noted that criteria requiring a degree of interpretation, though considered to be important, such as the requirement for 'concentrate and contain' or a 'passively safe wasteform' were considered to be an integral part of the attribute identification and scoring process described in sections 3.4 and 3.5.

The most relevant screening criteria in this context are identified in the following section.

#### 3.2.1 Compliance with UK law and international conventions

With regard to national law and international conventions, the most relevant relate to:

- London Convention: the marine environment has been specially protected with international treaties and conventions since the 1950s. Disposal to sea of solid radioactive waste was indefinitely suspended in the UK in 1985 after an extension to the 'London Convention' treaty.
- OSPAR Convention on the Protection of the Marine Environment: the UK is a signatory of the 'OSPAR Convention' of 1992 which covers the protection of the North-East Atlantic. The strategy on radioactive substances, created under this convention, includes the objective to reduce discharges, emissions and releases of radioactive substances by 2020, with the ultimate aim of reducing the additional concentrations of naturally occurring radionuclides in the marine environment to near background levels, and to close to zero of artificial radionuclides [OSPAR, 1998].

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal: provides a framework for a global system of environmental controls on transfrontier movements of waste. The convention seeks to reduce transboundary movements of hazardous wastes to a minimum, dispose of these wastes as close as possible to where they were generated and minimise their generation.
- Groundwater Regulations: the disposal of liquid wastes containing List I substances into groundwater is forbidden by the Water Environment and Water Services (Scotland) Act 2003 and the relevant regulations – the Water Environment (Controlled Activities) (Scotland) (Amendment) Regulations 2007.
- Protection from Radiation: general principles for the protection of humans from the harmful effects of ionising radiation are established by the ICRP. The ICRP's system of radiological protection was affirmed in 1991 [ICRP, 1991] to consist of just three basic principles (i) 'justification' which requires that a practice must do more good than harm; (ii) 'optimisation' which requires that the benefit of the practice must be maximised; and (iii) 'limitation' which requires an adequate standard of protection. These principles are further interpreted in a practical manner in European (e.g. EURATOM Basic Safety Standards) and UK legislation (e.g. lonising Radiation Regulations, see below).
- Ionising Radiations Regulations: the Ionising Radiations Regulations 1999 [The Ionising Radiation Regulations, 1999] require employers to keep exposure to ionising radiations as low are reasonably practicable (ALARP) and they are enforced by the HSE. Exposures must not exceed specified dose limits. Restriction of exposure should be achieved first by means of engineering control and design features. Where this are no reasonably practicable alternatives employers should introduce safe systems of work and only rely on the provision of personal protective equipment as a last resort.

# 3.2.2 Consistency with UK policy and guidance

With regard to UK policy, the most relevant relate to:

Policy on Radioactive Waste Management: The primary statements of UK policy on radioactive waste management are contained in Cmnd 2919 [Secretary of State for the Environment, 1993] and the recently published 'Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom [Defra et al, 2007]. Cmnd 2919 provides specific policies for a range of waste categories and management processes. Cmnd 2919 takes account of guidance from international bodies such as the ICRP and IAEA [IAEA, 1993], as well as the views of official UK advisory bodies such as NRPB [NRPB, 1992]. Some aspects of this document, related to the management of low level radioactive waste, have been amended or superseded by the LLW policy document. For example, Cmnd 2919 places restrictions on the export and import of radioactive waste may to or from other countries to small quantities and under special conditions. The new policy for LLW amends the policy with regard to LLW; export and import of LLW may be permitted for the recovery of re-useable materials or for treatment that will make its subsequent storage and disposal more manageable. Additionally Cmnd 2919 sets out the policy aim to store waste in a passively safe condition. With regard to LLW, the new policy includes a presumption towards



management solutions which can be implemented 'early rather than late'. The LLW policy also supersedes previous policy on disposal of LLW at landfill sites by stating that there 'is no reason to preclude controlled burial<sup>3</sup> from nuclear sites from the list of options to be considered in any options assessment' [Defra, 2007]. The categorisation of very low level waste (VLLW) is also modified to allow for 'dustbin disposal' of low volume VLLW to an unspecified landfill and disposal of high volume VLLW to specified landfill sites.

- Policy statement on the Decommissioning of the UK Nuclear Industry's Facilities: this policy statement [UK Government, 2004] replaces paragraphs 120 -131 of Cm 2919. It sets out the requirement for operators to produce and maintain a decommissioning strategy which includes a comprehensive decommissioning plan for safely carrying out the decommissioning process with due regard to security and protection of the environment. It also sets out policy with respect to the review of decommissioning strategies, the funding of decommissioning operations the dissemination of best practice and the requirement to consider decommissioning at the design stage for new facilities.
- Regulations and Guidance on Radioactive Waste Management: detailed guidance on requirements for the authorisation of LLW and ILW disposal has been published [EA *et al.*, 1997] by the EA and SEPA. The guidance interprets policy described in Cmnd 2919 in more detail in practical terms. The policy aims to require that waste is stored in a passively safe condition is set out in the guidance.

# 3.3 Chosen Screening Criteria

The general screening criteria identified for the purposes of this project are outlined in Tables 1 and 2 below.

Criterion	Name	Description
1	London Convention	Disposal of solid radioactive waste at sea is suspended indefinitely.
2	OSPAR Convention	Reduction of discharges by 2020 with the aim of reducing additional concentrations of natural radionuclides in the north eastern Atlantic to close to background, and close to zero for artificial radionuclides.
3	Controlled Activities Regulations	The disposal of liquid wastes containing certain listed substances into groundwater is forbidden by the Controlled Activities Regulations.
4	Dose limits	The annual individual dose to members of the public must not exceed 1 mSv/yr. Doses to workers are limited to 20 mSv/yr averaged over five years (other limits also apply).

 Table 1
 Criteria
 from
 Conventions,
 Legislation
 and
 Regulations
 Relevant
 to

 Radioactive
 Waste
 Management
 Options
 National State
 Nationa

<sup>&</sup>lt;sup>3</sup> Also known as 'special precautions burial' – the burial of LLW that could be disposed of as VLLW at landfill sites.

ĺ	Criterion	Name	Description
	5	Waste import and export	Radioactive waste may only be exported to (or imported from) elsewhere in small quantities and under special conditions.
	6	Guidance on the conditioning of ILW	EA guidance on ILW conditioning requiring it to be made passively safe.

 Table 2
 Criteria from Government Policies and Guidance Relevant to Radioactive Waste Management Options

# 3.4 Attribute Lists

When selecting attributes for use in this study, a list of suggested attributes was developed in discussion with British Nuclear Group staff, based on previous experience.

Environmental objectives were included as attributes to capture the consideration of how the study takes into account certain policy aims such as the philosophy of the Government's waste hierarchy, the policy shift from 'dilute and disperse' towards 'concentrate and contain' and the policy aim to ensure hazard reduction by implementing passively safe systems for managing materials. The attribute relating to waste volumes also results from the policy aim to ensure waste minimisation but also allowed consideration of the potential impact of certain options on disposal routes which have limited capacity, such as the National LLW repository near Drigg. These attributes were different in nature to the attributes relating to environmental impact which are concerned with considerations about impact on specific environmental media and amenity.

The list of attributes was organised into a number of separate groups that cover a range of all relevant topics, so as not to overly place an emphasis on one particular issue. This is consistent with the approach suggested in the EA-SEPA guidance on BPEO studies for radioactive waste management [EA & SEPA, 2004]. The attribute groups considered in this study were:

- Health and safety: attributes in this group reflect the confidence that an option could protect human health from both radiological and nonradiological impacts. Three separate attributes were identified in this group:
  - public health and safety (for individuals),
  - public health and safety (societal),
  - worker health and safety (for individuals).
- Environmental impacts: two sub-groups of attributes are recognised in this group:
  - physical environment which is further subdivided into air quality, water quality, land, visual impact, nuisances (i.e. noise and vibration, dust, light and odour) and energy usage and transport emissions.
  - flora and fauna to reflect the fact that there is a clear distinction in UK environmental and planning laws between the consequences of industrial and construction activities on these two elements.

- Environmental objectives: these attributes reflect the Government policy objectives in such matters as:
  - waste minimisation, waste reuse and recycling,
  - the rate of hazard reduction,
  - the move towards concentrate and contain,
  - the generation of secondary wastes,
  - greenhouse gas emissions, and
  - the proximity principle.
- **Technical performance**: attributes in this group address an option's ability to perform its planned function. Four separate attributes were identified in this group:
  - viability is the ease with which it can be demonstrated that an option is technically feasible within time constraints imposed by the Chapelcross LTP, considering the existing maturity of technology, the continued availability of the option and the throughput or capacity of the option,
  - nuclear safety relates to the requirement for the waste to meet the Conditions for Acceptance at the receiving site (e.g. the National LLW repository near Drigg) or to gain a Letter of Compliance for an ILW wasteform from Nirex,
  - flexibility is the scope for the strategy option to be varied, if required to meet requirements for different end-points; and
  - programme relates to the likelihood that an option could be carried out within the timescales of the Chapelcross LTP, will reduce the project risk to the NDA; will result in a reduction of the NDA's liabilities at Chapelcross and the consistency of the option with the preferred site end state.
- **Socio-economic**: attributes in this group are concerned with possible economic impacts to the local community (the immediate area surrounding Chapelcross) in terms of economy, and culture and heritage.

#### • Regulatory issues:

- regulatory acceptance (HSE, NII, EA, planning etc.) was also assessed using a separate attribute.
- Financial cost: this group contains three attributes:
  - the undiscounted cost of implementing each option within the constraints and scope of this study. This includes the capital costs of new plant (including development costs), plus operational and decommissioning costs, as well as the cost of interim storage on site of the volumes of wastes generated or the cost of disposal. Undiscounted costs were used as opposed to discounted cost

because they give a time independent assessment of costs which can be meaningfully compared,

- the rate of spend compared to the current estimates contained within the LTP is used as a proxy to assess the relative affordability of options, and
- an attribute to assess the stability of cost estimates is used to identify particular areas subject to high uncertainty or volatility.

The attribute groups, attributes and sub-attributes derived for use in the study are listed in Appendix B. The listing in Appendix B is considered to master list for the project, not all attributes were considered to be relevant to all the waste categories.

# 3.5 Scoring Schemes for Attributes

To help make the option scoring process consistent and to relate the numerical scores to meaningful measures of performance, scoring (calibration) schemes were devised for each sub-attribute. The approach adopted was that if the performance of a strategy option as judged against a sub-attribute was considered to be "unacceptable" then a score of 0 was awarded. If the performance of a strategy option as judged against a sub-attribute is considered to be "ideal" then a score of 5 was awarded. Intermediate integer scores of 1 to 4 are possible and would generally equate to a range of "acceptable" performance.

Some calibrated scoring schemes were defined quantitatively (e.g. for risks to human health) and other were defined qualitatively (e.g. air quality). Qualitative scoring schemes were adopted when no numerical data on performance were possible or available, for example when an evaluation is entirely subjective. The requirements used in the study for each sub-attribute are given in Appendix B.

# 3.6 Scoring of options

Scoring of the options for the Chapelcross site against the attributes was undertaken by a two stage process:

- 1. British Nuclear Group staff, who attended the optioneering workshop, were provided with scoring spreadsheet templates and supporting briefing material on attributes and scoring criteria. A small number of staff completed spreadsheets. It was agreed that the mean of the individual scores should be used as a consensus measure due to the small sample size. The standard deviation between individual scores was also calculated to identify the attributes where there was significant spread in individual results.
- 2. A scoring workshop was held at which the consolidated scoring spreadsheets for each waste group were discussed in a 'round-table' forum made up of British Nuclear Group staff with a wide-range of specialist knowledge and practical experience with support from an independent environmental consultancy. Due to time constraints, discussions were focused on those attributes where there was a significant spread in individual scores (standard deviation > 2). The panel members are detailed in Appendix C.

#### 3.7 Weighting schemes

A number of different weighting schemes were applied to the scores to test the sensitivity of the results and the conclusions given above. If the application of different weighting schemes does not change the conclusions, then those conclusions can be deemed to be robust.

Different weighting schemes were applied and these are shown in Table 3. These weightings were applied to the normalised (average) scores for each attribute group, so as to avoid biasing the results in favour of groups with a large number of sub-attributes. For example, if the unweighted score for an option in the 'Human health and safety' attribute group is 31, the chosen weighting factor is 10, and there are 7 sub-attributes in the group, then the normalised weighted score for the group is  $(31\times10)/7 = 44$ .

Attribute group	'Preferred' Team Weighting	Technology position	Environmental position	Financial position
Human health and safety	10	10	10	1
Environmental impact	10	1	10	1
Environmental objectives	5	1	10	1
Technical	8	10	1	1
Socio-economic	1	1	1	1
Stakeholder	5	1	1	1
Financial cost	8	10	1	10

 Table 3
 Adopted weighting schemes

The 'Preferred Team Weighting' scheme was agreed in consultation with the British Nuclear Group project manager, and based on previous group weightings established for another Magnox Electric site.

The other weighting schemes reflect a number of possible 'positions' that could be held by interested parties. For example, the 'Environmental position' weighting scheme reflects a viewpoint that supports the minimisation of all environmental impacts with less concern for costs and technical restrictions.



# 4. INTERMEDIATE LEVEL RADIOACTIVE WASTE

### 4.1 The Waste

A range of intermediate level wastes are expected to arise from routine operations and care and maintenance preparations. These were identified by BNG staff and discussed at the optioneering workshop.

Some ILW streams are dispatched for storage in the Miscellaneous Beta Gamma Waste Store (MBGWS) at Sellafield as per the MBGWS Conditions for Acceptance (CfA) and the Chapelcross site discharge authorisation. Other ILW waste streams are stored on site and decommissioning of the reactor buildings is pending the establishment of a UK disposal route for ILW. These are summarised below in Table 4.

Waste material name	Current location	Total amount	Description
Operational Waste			
Miscellaneous Activated Components	Reactors and Ponds	1.5 m <sup>3</sup>	Activated components including: stainless steel compacted liners, dry stored in stainless steel containers, shield plugs and coupling.
Miscellaneous Reactor Components	Reactors (90%) and Cooling ponds (10%)	38.6 m <sup>3</sup>	Activated components include: reactor furniture (2-3 m <sup>3</sup> ); holding down weights, support struts, and thermocouples. Mainly steel but some magnox and Al cladding and graphite materials. Stored in skips (wet and dry storage).
lon exchange resins	Fuel storage ponds	48.8 m <sup>3</sup>	Spent AW500 zeolite ion exchange resins. 48 spent resin components in storage and up to another 12 in use.
Sludges	Cooling pond building	8 m <sup>3</sup>	Sludges containing corrosion products from the ponds. Corrosion products from ponds. Around 2 m <sup>3</sup> is stored in skips; the remainder is in detention tanks.
CXPP ceramic pellets		9.7 m <sup>3</sup>	Dry stored in 2020 bottles and stainless steel cans in temporary storage vessels.
Contaminated plant components	СХРР	3.6 m <sup>3</sup>	Includes tritium contaminated steel plant (pipes, valves, etc) and graphite. Stored in disposable flask liners.
Rotary Pump Oil	СХРР	Max 0.5 m <sup>3</sup>	Tritium contaminated oil. Stored in stainless steel cans

#### Table 4 Intermediate Level Waste Materials at Chapelcross

#### BEST PRACTICABLE ENVIRONMENTAL OPTION FOR CARE AND MAINTENANCE PREPARATION WASTES AT CHAPELCROSS

Waste material name	Current location	Total amount	Description
Operational Waste			
Fuel skips in ponds 1 & 2	Ponds 1 & 2	200 m <sup>3</sup>	190 skips of mild steel with Cs surface contamination present in the paint.
Dessicant	Reactor building	0.4 m <sup>3</sup>	800 kg Al in the form of pellets, heavily loaded with tritium in humidriers; activity to be verified.
Spent furnaces	СХРР	6 units (0.25 m <sup>3</sup> )	Tritium and depleted uranium contamination. Composed of a steel outer case and uranium inner lining.
Care and Maintenance	preparations was	ste	
CXPP Dismantling ILW		237.0 m <sup>3</sup>	Post-operational clean out and plant cleanout wastes e.g. vacuum furnace, pipework. Materials include stainless steel, alloys, plastic, o-rings and stack pumps with tritium and activation product contamination. Rotary and diffusion pumps and motors may also fall into

# 4.2 ILW waste grouping

Due to the number of types of ILW to be included in the study a scheme was developed to rationalise the waste types. The objective was to simplify the study by grouping types of wastes that are amenable to similar treatment techniques. The components of the complex location-specific waste streams above were identified from information provided by BNG staff and through discussion at the Optioneering workshop and with reference to the 2004 UK Radioactive Waste Inventory [Nirex and Defra, 2005].

#### Table 5ILW Waste Groups

	Metal	Ceramics	Sludges	Resins	Aggregate	Magnox & Graphite	Dessicant	Oils & Oily wastes
Operational waste	i	i	i	i		i	i	1
Miscellaneous Activated Components	~							
Miscellaneous Reactor Components	~					~		
Ion exchange resins				~				
Sludges			✓					
CXPP ceramic pellets		~						
Contaminated plant components	~							
Rotary Pump Oil								✓
Miscellaneous beta/gamma waste	~							
Fuel skips in ponds 1 & 2	~							
Pond skip decontamination sludges			✓					
Dessicant							~	
Spent furnaces	~							
Spent sources								
C&M Preps								
CXPP Dismantling ILW	~				>			
Pond Structures					~			

# 4.3 The management options for ILW

A number of management options for ILW were identified during the initial optioneering workshop. These were:

- Deferred retrieval and treatment;
- Blend ILW with LLW to reclassify the ILW;



- Decontamination;
- Condition ILW and interim store (on site) pending long-term UK solution;
- Overseas disposal;
- Deep sea disposal;
- Treatment and discharge to borehole;
- Thermal treatment;
- Transfer to another site for treatment prior to disposal;
- Transfer to another site for disposal.

# 4.4 Screening the ILW Options

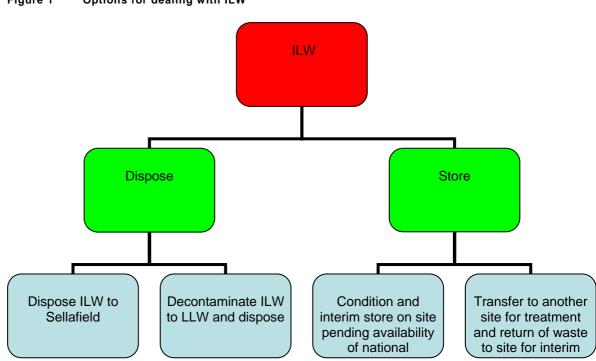
Using the screening criteria in Section 3.3, waste management options were examined and screened. Table 6 and the flowchart in Figure 1 shows the options and screening process and indicates the reasons for screening certain options out.

Option	Screened?
Deferred retrieval and treatment	Yes – perceived to be against NDA contract conditions by BNG staff.
Blend ILW with LLW to reclassify the ILW	Yes – against policy
Decontamination	No
Condition ILW and interim store pending long-term UK solution	No
Overseas disposal	Yes – against policy/Basel Convention (only possible when processes not available here)
Deep sea disposal	Yes – London Convention <sup>4</sup>
Treatment and discharge to borehole	Yes – likely to be against policy (e.g. Water Environment (Controlled Activities) (Scotland) (Amendment) Regulations 2007.
Thermal treatment	No
Transfer to another site for treatment prior to disposal	No
Transfer to another site (Sellafield) for disposal	No

#### Table 6 Management Options identified for ILW

<sup>&</sup>lt;sup>4</sup> Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 and 1996 Protocol thereto.

BEST PRACTICABLE ENVIRONMENTAL OPTION FOR CARE AND MAINTENANCE PREPARATION WASTES AT CHAPELCROSS



#### Figure 1 Options for dealing with ILW

#### 4.5 The short-listed ILW management options

#### 4.5.1 **Disposal Options**

#### Dispose ILW to Sellafield

Waste would be conditioned and packaged suitability then disposed of by transfer to Sellafield. This is a current practice, authorised under RSA 93 for certain wastes.

#### Decontaminate ILW to LLW and dispose to LLWR near Drigg

Decontamination of ILW using wet or dry techniques to remove contamination resulting in waste complying with LLW limits set out in the LLW Policy document [Defra et al, 2007] and meeting the Conditions for Acceptance (CfA) for the LLWR near Drigg.

#### 4.5.2 **Storage Options**

#### Condition and interim store on site

Waste would be conditioned to passive safety and stored in an interim store on site pending availability of national repository. This would require the granting of a Letter of Compliance (LoC) and the building of an engineered interim store.

### Transfer to another site for treatment and return of waste to site for interim storage

This option would involve transfer to another UK Nuclear Licensed Site where it would be conditioned to passive safety. The conditioned waste product would be returned to Chapelcross for interim storage. This would require the granting of a LoC and the building of an engineered interim store. This may be subject to authorisation under RSA 93 and regulations related to the transportation of radioactive waste.

# 4.6 Matching the Management Options to the ILW Waste Groups

The short-listed options and ILW types were examined and the matrix in Table 7 was developed to show the options which could be applied to each type of ILW.

	Decontaminate ILW to LLW	Condition and interim store on site pending availability of national repository	Transfer to another site	Dispose of ILW to Sellafield	No. of Options
Metal	✓	$\checkmark$	✓	~	4
Ceramics		✓	✓	~	3
Sludges		✓		~	2
Aggregate	✓	✓			2
Resins		✓	~		2
Magnox and Graphite		~	~	~	3
Dessicant		✓	~	✓	3
Oily waste		✓	~	✓	3

 Table 7
 Possible Management Options for each type of ILW

# 4.7 The Attributes and Scoring Scheme

The attributes and scoring scheme in Appendix B were used to score the options for each waste type. The results are outlined in the sections below.

# 4.8 The ILW scores

A summary of the unweighted and weighted scores for each waste group are presented below. The option giving rise to the highest unweighted score is identified for each group together with any key determining factors. The number of ideal (5) and unacceptable (0) scores are also identified as appropriate. The robustness of the choice of the highest scoring option is considered by identifying any differences that arise from the application of the various weighting schemes.

The detailed consolidated scores are included in Appendix D. Where there was discussion of scores during the scoring workshop, a note of the discussion is also included in the tables in this appendix.

#### 4.8.1 Metal

Four management options were identified for metals. Detailed raw and weighted scores are contained in Appendix D. A summary of the scores is given in Table 8 below.

	Decontaminate to LLW	Condition and interim store on site pending availability of national repository	Transfer to another site for processing and return to Chapelcross	Dispose of ILW at Sellafield
Overall unweighted total	115	122	100	112
No. of 5s	0	1	0	0
No. of 0s	0	0	0	0
Overall team weighted total	148	162	133	150
Overall technology weighted total	105	117	95	107
Overall environmental weighted total	113	112	97	105
Overall financial weighted total	46	54	44	49

 Table 8
 Scoring for ILW Metal Waste Treatment Options

The option involving conditioning and interim storage receives the highest overall unweighted score, primarily due to its higher scoring under attributes within the technical and financial headings. Under the technical grouping, this option received a maximum score (5) for throughput. It also received the highest scores for attributes related to: scheduling variance to LTP; consistency with the end state and minimisation of project risk to the NDA. The high scores arise from the fact that this option is already included in current plans.

The option involving conditioning and interim storage continue to be the highest scoring option under all of the weighting schemes, although decontamination to LLW receives similarly high scores under the environmental weighting. This is the result of the greater relative weight given to environmental objectives under this weighting scheme – and the correspondingly greater weight applied to the higher scores for decontamination option for the following attributes: waste volume; hazard reduction and generation of greenhouse gases.

#### 4.8.2 Ceramics

Three management options were identified for ceramics. Detailed raw and weighted scores are contained in Appendix D. A summary of the scores is given in Table 9 below.

	Condition and interim store on site pending availability of national repository	Transfer to another site for processing and return to Chapelcross	Dispose of ILW at Sellafield
Overall unweighted total	114	104	114
No. of 5s	0	0	0
No. of 0s	0	0	0
Overall team weighted total	152	134	153
Overall technology weighted total	108	101	110
Overall environmental weighted total	110	98	106
Overall financial weighted total	46	47	50

Table 9 Scoring for ILW Ceramics Waste Treatment Options

The following two options receive similar unweighted scores for this waste stream: conditioning and interim storage and disposal at Sellafield. There is little to distinguish the options from one another within the different attribute headings and both options score similarly under each of the various weighting schemes.

### 4.8.3 Sludges

This waste group includes Magnox contaminated sludge amd materials from pond skip decontamination. Two management options were identified. Detailed raw and weighted scores are contained in Appendix D. A summary of the scores is given in Table 10 below.

The option involving conditioning and interim storage receives the highest overall unweighted score, although this is very similar to the overall scoring for the alternative option – disposal of ILW at Sellafield. The higher scores for the conditioning and interim storage option derive from attributes under the following headings: environmental objectives and technical. The particular attributes under the environmental objectives heading concerned are: hazard reduction, concentrate and contain and the proximity principle. This reflects the assumed effectiveness of the conditioning requirements to render the waste in a contained passive state and the fact that wastes are not moved off-site. The main distinguishing technical issues are the continued availability of the option and the likelihood of meeting conditions for acceptance for disposal at Sellafield.

	Condition and interim store on site pending availability of national repository	Dispose of ILW at Sellafield
Overall unweighted total	118	114
No. of 5s	0	0
No. of 0s	0	0
Overall team weighted total	155	149
Overall technology weighted total	112	108
Overall environmental weighted total	108	109
Overall financial weighted total	51	49

 Table 10
 Scoring for ILW Sludge Waste Treatment Options

The option involving conditioning and interim storage is the highest scoring option under all weighting schemes, although the alternative option – disposal at Sellafield – scores similarly under environmental and financial weighting schemes. The environmental weighting result is due to the fact that disposal at Sellafield receives higher scores for environmental impact (for air, water and land quality and for visual impact) and these attributes are given a relatively greater weight under the environmental weighting scheme. The financial scoring result is a consequence of the fact that the options score similarly under the financial heading and that under this weighting scheme, these attributes are given significantly greater weight than other attributes for which the options score differently.

#### 4.8.4 Resins

Two management options were identified for resins. Detailed raw and weighted scores are contained in Appendix D. A summary of the scores is given in Table 11 below.

The option involving conditioning and interim storage received the higher overall unweighted total score. The main distinguishing groups of attributes were the human health and safety and technical issues. The alternative option – which involves transfer of waste off-site for treatment and return of conditioned waste – receives lower scores under the human health and safety heading due to the potential for public doses and non-radiation risks associated with moving waste materials on and off-site. The lower scores for the off-site transfer option under the technical heading arise from the attributes related to: continued availability and throughput of the option, and minimisation of risk to NDA. This is a reflection of this option's dependence on a third party.

	Condition and interim store on site pending availability of national repository	Transfer to another site for processing and return to Chapelcross
Overall unweighted total	123	107
No. of 5s	0	0
No. of 0s	0	0
Overall team weighted total	166	141
Overall technology weighted total	122	101
Overall environmental weighted total	115	102
Overall financial weighted total	57	48

 Table 11
 Scoring for ILW Resin Waste Treatment Options

The option involving conditioning and storage remains the highest scoring option under each of the weighting schemes

## 4.8.5 Aggregate

Two management options were identified for aggregate. Detailed raw and weighted scores are contained in Appendix D. A summary of the scores is given in Table 12 below.

	Decontaminate to LLW	Condition and interim store on site pending availability of national repository
Overall unweighted total	109	116
No. of 5s	0	0
No. of 0s	0	0
Overall team weighted total	141	155
Overall technology weighted total	101	111
Overall environmental weighted total	103	110
Overall financial weighted total	45	50

 Table 12
 Scoring for ILW Aggregate Waste Options

The option involving conditioning and interim storage received the higher unweighted score. This is primarily the result of the higher scores under the human health and safety heading, and the attributes related to public doses and risks in particular due to the higher radiation doses expected to arise from the alternative option of decontamination. The option involving conditioning and interim storage continues to receive the higher scores under each of the various weighting schemes.

### 4.8.6 Magnox and Graphite

Magnox and graphite were considered as a combined waste group because these materials were considered to be amenable to similar treatment methods. Three management options were identified for Magnox and graphite. Detailed raw and weighted scores are contained in Appendix D. A summary of the scores is given in Table 13 below.

	Condition and interim store on site pending availability of national repository	Transfer to another site for processing and return to Chapelcross	Dispose of ILW at Sellafield
Overall unweighted total	115	102	114
No. of 5s	0	0	1
No. of 0s	0	0	0
Overall team weighted total	153	133	154
Overall technology weighted total	109	94	114
Overall environmental weighted total	110	97	101
Overall financial weighted total	50	39	50

 Table 13
 Scoring for ILW Magnox and Graphite Waste Treatment Options

The options involving conditioning and interim storage and the option involving disposal of ILW at Sellafield received similarly high overall unweighted scores. Conditioning and interim storage received higher scores under the environmental objectives heading, due to its relative scores for attributes related to hazard reduction, greenhouse gas emissions and the proximity principle. The disposal at Sellafield option received higher scores under the technical heading, for a range of attributes. This included a maximum score (5) – for the maturity of technology attribute – due to the fact that this disposal route is already in existence.

These options also score similarly under the team and financial weighting schemes. Disposal at Sellafield is the highest scoring option under the technology weighting, while the option involving conditioning and interim storage is higher scoring under the environmental weighting scheme. This variation is the result of the higher weighting applied to environmental objectives under the environmental weighting – and consequently higher weighted scores for conditioning and interim storage, and the higher weighing given to the technology heading under the technology weighting – and the correspondingly higher weighted score assigned the existing disposal route to Sellafield.

## 4.8.7 Dessicant

Three management options were identified for Dessicant. Detailed raw and weighted scores are contained in Appendix D. A summary of the scores is given in Table 14 below.

	Condition and interim store on site pending availability of national repository	Transfer to another site for processing and return to Chapelcross	Dispose of ILW at Sellafield
Overall unweighted total	121	103	107
No. of 5s	0	0	0
No. of 0s	0	0	0
Overall team weighted total	163	131	143
Overall technology weighted total	123	99	109
Overall environmental weighted total	111	97	98
Overall financial weighted total	57	43	51

 Table 14
 Scoring for ILW Dessicant Waste Treatment Options

The option involving conditioning and interim storage received the highest overall unweighted score. This option is also the highest scoring option for each of the attribute headings. It is also the highest scoring option under each of the weighting schemes.

### 4.8.8 Oils and Oily Wastes

Three management options were identified for Oils and Oily wastes. Detailed raw and weighted scores are contained in Appendix D. A summary of the scores is given in Table 15 below. The option involving conditioning and interim storage received the highest overall unweighted score. This option is the highest scoring option under each of the attribute headings, but the greatest differences arise from the human health and safety and environmental impact headings. Under the health and safety heading, this option was considered likely to give rise to lower radiation doses and non-radioactive risks to members of the public than other options, while under the environmental impact heading, it was considered likely to have lower off-site environmental impacts due to the lower levels of off-site transport (reflected in scores for air and water quality, nuisance and transport). This option also

scores a single maximum score – for proximity principle – due to the on-site nature of the processes.

	Condition and interim store on site pending availability of national repository	Transfer to another site for processing and return to Chapelcross	Dispose of ILW at Sellafield
Overall unweighted total	119	101	94
No. of 5s	1	0	0
No. of 0s	0	0	1
Overall team weighted total	158	130	125
Overall technology weighted total	111	91	88
Overall environmental weighted total	115	97	91
Overall financial weighted total	50	41	43

 Table 15
 Scoring for ILW Oily Waste Treatment Options

Disposal at Sellafield was initially considered to be an option but, during scoring, it was considered to be unacceptable (and a zero score was assigned for attribute related to the likelihood of meeting CfA) because liquid wastes are excluded under the CfA for Sellafield.

The option involving conditioning and interim storage is also the highest scoring option under each of the weighting schemes.

# 4.9 The highest unweighted scoring options for ILW

A summary of the highest unweighted scores for ILW is shown in Table 16.

ILW group	Highest scoring option
Metals	Conditioning and interim storage
Ceramics	Conditioning and interim storage or Disposal at Sellafield
Sludges	Conditioning and interim storage
Resins	Conditioning and interim storage
Aggregate	Conditioning and interim storage
Magnox and graphite	Conditioning and interim storage or Disposal at Sellafield
Desiccants	Conditioning and interim storage
Oils and oily wastes	Conditioning and interim storage

 Table 16
 The highest unweighted scoring options for ILW



#### BEST PRACTICABLE ENVIRONMENTAL OPTION FOR CARE AND MAINTENANCE PREPARATION WASTES AT CHAPELCROSS

It is important to consider this summary information in context; in some cases a relatively small number of options was considered and the differences between the scores may not be significant.



# 5. LOW LEVEL RADIOACTIVE WASTE

### 5.1 The Waste

LLW arises as primary and secondary wastes from ongoing operations. Significantly increased volumes of LLW will be generated during care and maintenance preparations, principally due to building materials, but this waste stream will also include a range of other materials.

LLW is sorted, assayed and size reduced as appropriate prior to being packaged in drums or placed directly into ISO containers, for disposal to the National LLW repository near Drigg. The National LLW repository near Drigg stipulates precise acceptance criteria, and certain wastes require pre-treatment or conditioning to meet these.

The following types of LLW were identified at Chapelcross from information provided by BNG staff and from discussions at the optioneering workshop.

Waste material name	Current location	Total amount	Description			
Operational waste						
CXPP tritiated waste	СХРР	4 m <sup>3</sup> per year. Around 20 m <sup>3</sup> in total	Mainly soft waste (clothes, gloves, tissues etc). Stored in alkathene containers in 205 I drums (waste and containers combustible). Not suitable for super compaction (due to potential for H-3 release).			
Reactor and associated areas LLW	In reactors and CXPP	Current arisings 74 m <sup>3</sup> per year during normal operations. Expected to increase to 120 m <sup>3</sup> per year and to peak at 300 m <sup>3</sup> /y during defuelling.	Soft waste (PPE and fabric) Stored in 205 I drums (as above).			
Cooling ponds LLW		Current average 6.4 m <sup>3</sup> per year. Peak during decommissioning.	Soft waste arising from flask cleaning (wipes etc.) primary contaminant Cs. The peak expected during repackaging of waste from ponds. Stored in 205 litre drums.			
Large Items from Reactor Areas		892.0 m <sup>3</sup> (Total)	Comprises steel plant and equipment (primarily various grades of steel and some lead) including: contaminated charge baskets; redundant flasks (PRDO); grabs, BCGDs (cast steel). Not expected to be activated or contaminated with PCBs. Wrapped and stored in			

Table 17 Summary of LLW types

# BEST PRACTICABLE ENVIRONMENTAL OPTION FOR CARE AND MAINTENANCE PREPARATION WASTES AT CHAPELCROSS

Waste material	Current	Total amount	Description			
name	location		HHISO.			
Large items from Cooling Ponds		15.6 m <sup>3</sup> per year (current operational arisings – increase during C&M preps)	Comprises grabs, pumps, lights, scaffold boards. Wrapped and loose stored in HHISO.			
UO3 contaminated LLW	Building 141	16.0 m <sup>3</sup> (total value)	Soft waste and plywood boards Stored in 205 I drums			
Oils	Hanger 39 (following dismantling of Tank Farm)	100,000 litres	Comprises a mix of liquid organic waste stored in plastic double lined tanks. Approx. 50,000 I of this amount exempt under SoLA. Remainder (approaching 40,000 I) will be stored on site pending authorisation. Trace beta contamination (H-3 and C- 14 activities below 0.4 Bq/g). An additional 50,000 I oily waste in blowers, which may be categorised as LLW.			
Other liquid organic wastes		400 MBq H-3 200 kBq C-14 and S-35	Scintillant			
Hydraulic fluids	B151 (CXPP)	560 litres	Stored in 55 plastic bottles mixed with vermiculite within stainless steel drums. Unsuitable for further treatment.			
Liquid effluent discharges from Ponds		Total volume of around 5.5 million litres from ponds	Liquid effluent arising from from ponds (and additional quantities from groundwater).			
Liquid effluent discharges from CXPP		Around 3,800 litres discharged 2-3 times per year	Liquid effluent arising from from CXPP.			
Groundwater ingress into reactor basements		Around 1,300,000 gallons annual average (subject to seasonal variations).	Groundwater tritiated to around 0.2-0.4 Bq/ml. Removed by pump and discharged through existing discharge pipeline.			
Aerial effluents	Processing plant (little from reactors)	200 TBq per year (Current authorised limit 5000 TBq/y)	Aerial discharge primarily H-3 from CXPP. Some C- 14 also discharged from reactors and expected to continue during C & M Preps.			
C&M preps waste						
Reactor LLW		4370 m <sup>3</sup>	Comprises large plant components, including: defuelling machines; turbo			

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BEST PRACTICABLE ENVIRONMENTAL OPTION FOR CARE AND MAINTENANCE PREPARATION WASTES AT CHAPELCROSS

Waste material name	Current location	Total amount	Description			
			generators; heat exchanger pipework; blowers; building fabric; iron ductwork; transformers; generators; large lead acid batteries; MMMF; switch gear scaffolding poles. Materials include cast steel (not much stainless steel); cement-bound asbestos; brickwork and reinforced concrete with surface contamination. Metals may be decontaminated but decontamination of other materials would be difficult. Not suitable for super compaction			
Ponds LLW		2330.0 m <sup>3</sup>	Comprises full pond structure including the walls (assuming to be contaminated to depth); redundant flasks; furniture and concrete. Not suitable for super compaction			
Redundant Active effluent pipeline concrete LLW		1335.0 m <sup>3</sup>	Cast concrete. Not suitable for super compaction. Management options for this pipeline are still under discussion – removal not certain.			
Replacement active effluent pipeline steel LLW		1,658 tonnes	Spun Steel; Surface contaminated with Cs and Sr. Not suitable for super compaction			
North site LLW	Currently in temporary storage building – expected to be removed before C&M Preps	270.0 m <sup>3</sup>	Not suitable for super compaction. This amount does not include cooling towers (due for demolition in April 2007 and considered to be uncontaminated).			
CXPP dismantling LLW (of the process line)		325.0 m <sup>3</sup>	This category relates to the containment of the process line (not including building structure). It comprises tritiated equipment (pumps, valves etc) of largely metal construction. Not suitable for super compaction			

# 5.2 LLW waste grouping

Due to the number of types of LLW to be included in the study, a scheme was developed to rationalise the waste types. The objective was to simplify

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the study by grouping types of wastes that are amenable to similar treatment techniques.

	Metal	Asbestos	Aggregate & Soil	Cellulosic	Plastic & Rubber	Water	Organic Liquids <sup>5</sup>
CXPP tritiated waste				√	✓		
Reactor and associated areas LLW		~		~	~		
Cooling ponds LLW			✓	✓	✓		
Large Items from Reactor Areas	~			~	~		
Large items from Cooling Ponds	~			~	~		
UO3 contaminated LLW				~	~		
Oils (lubricating and hydraulic)							~
Other liquid organic wastes							
Hydraulic fluids							
Liquid effluent discharges (Pond)						~	
Liquid effluent discharges (CXPP)						~	
Groundwater ingress into reactor basements						~	
Reactor LLW	✓						
Ponds LLW	~		~				
Active effluent pipeline concrete LLW			✓				
Active effluent pipeline steel LLW	~						
North Site LLW	~		~				
CXPP dismantling LLW	✓		✓				
General reactor LLW					✓		

Table 18LLW Waste Groups

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<sup>5</sup> Subject to a separate BPEO Study (as indicated in the following section)

# 5.3 The management options for LLW

A number of management options for LLW were identified:

- Deferred retrieval and treatment
- Decontamination to achieve SoLA exemption
- Incineration
- Disposal to hazardous landfill
- On-site landscaping
- On-site disposal
- Disposal to national VLLW repository
- Disposal to national LLW facility
- Overseas disposal
- Deep sea disposal
- Treatment and discharge to sea
- Treatment and discharge to borehole
- Melting and high temperature treatment
- Decay storage
- Conditional recycling
- Transfer to another site for treatment prior to disposal.

# 5.4 Screening the LLW options

Using the screening criteria in Section 3.3, waste management options were examined and screened. Table 19 and the flowchart in Figure 2 show the options and screening process.

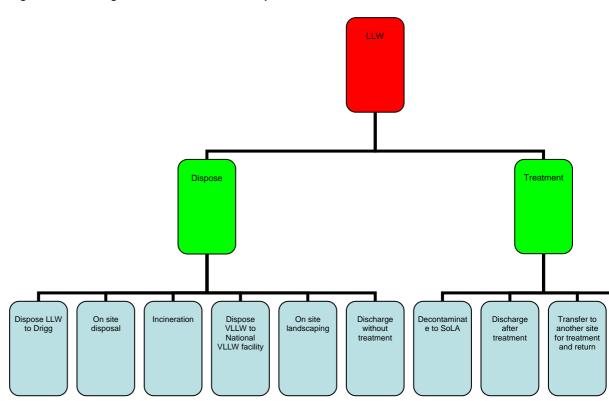
Option	Screened?
Deferred retrieval and treatment	Yes – perceived to be against NDA contract conditions by BNG staff.
Decontaminate to SoLA	No
Incineration	No
Dispose to hazardous landfill (special precautions burial)	No
On-site landscaping	No
On-site disposal in purpose built facility	No
Dispose of vLLW separately	No
Dispose of LLW to national LLWR near Drigg	No
Overseas disposal	Yes – against policy/Basel Convention (only possible when processes not available here)
Deep sea disposal	Yes – London Convention
Treatment and discharge to sea	No
Treatment and discharge to borehole	Yes – likely to be against policy (e.g. Water Environment (Controlled Activities) (Scotland) (Amendment) Regulations 2007.
Thermal treatment	No
Decay storage to SoLA	Yes
Recycle	Yes - recycling of LLW limited to particular waste forms, although there may be opportunities for industry-wide initiatives to increase re-use and recycling of some forms of LLW.
Transfer to another site for treatment prior to disposal	No

#### Table 19 Identified Management Options for Low Level Radioactive Waste

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BRITISH NUCLEAR GROUP
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#### Figure 2 Categories of LLW Treatment Options

# 5.5 The short-listed LLW options

#### 5.5.1 Disposal

#### • Disposal to the national LLWR

Disposal at Drigg is an established route for LLW which falls within the specification set out in the Conditions for Acceptance. Wastes which fall outside the specification set out in the conditions for acceptance may under certain circumstances be disposed under special arrangements. Drigg has limits on the radionuclides and activity it is able to accept set out in the authorisation granted under RSA93. Generally, waste of a conventional hazardous nature such as putrescible, pyrophoric and explosive are not accepted and in general waste has to be immobilised to prevent migration of radionuclides from the containers into the facility and beyond.

#### • Dispose on site

This would require the building of a new disposal facility. Waste may need further conditioning or treatment to passive safety whilst the facility becomes available. It is foreseen that this option would require the construction of a new store on the site because existing buildings on the Chapelcross site are not suitable or are planned to be demolished as part of the planned site restoration programme.

#### • Incineration

Solid radioactive waste that is combustible or is not suitable for disposal to landfill because of its hazardous properties may be authorised for disposal by incineration at an authorised incinerator. Incineration often results in a large volume reduction and the release of volatile radionuclides from the waste. It is normal for the resultant ash to be disposed of as a solid waste. In this study, the incinerator is assumed to be off-site at a location more distant than the national LLWR.

# • Dispose VLLW to a National VLLW facility

There is a significant amount of waste from decommissioning that contains low levels of radionuclides at the bottom end of the levels currently considered to be LLW and often referred to as VLLW. An updated waste management policy for the long-term management of LLW within the UK has recently been published [Defra *et al.*, 2007] which does not preclude controlled burial of VLLW from nuclear sites and which identifies two categories of VLLW: Low Volume VLLW, for which 'dustbin disposal' to an unspecified landfill may be appropriate; and high volume VLLW which may be disposed of to specified landfill sites.

# On-site landscaping

This is envisaged to be the use of inert construction and demolition material predominately for the infill of turbine hall basements or other landscaping applications.

# • Discharge without treatment

This is only considered to be an option for aqueous liquid wastes such as cooling pond water and water arising from groundwater control practices.

# 5.5.2 Treatment

# Decontaminate to SoLA

The removal of contamination could allow material to be exempted from RSA93 by meeting the conditions of SoLA. Such decontamination may be possible using simple techniques such as wiping or washing or more aggressive techniques such as high-pressure jet washing.

# • Discharge after treatment

This is envisaged to include the discharge of liquid waste following treatment. This would require the construction of a purpose-built facility on-site.

# • Transfer to another site for treatment and return

This is an interim option which would result in the waste product returning to Chapelcross for inclusion in another final disposal option.

#### • Thermal treatment

This option in envisaged for waste contaminated only with tritium. The waste would be heated to volatilise the tritium which would be disposed as an aerial discharge. The aim would be that the heated waste would be below SoLA levels.

# 5.6 Matching the management options to the LLW waste groups

The short-listed options and LLW types were examined and the matrix in Table 20 was developed to show the options which could be applied to each type of LLW.

	Decontaminate to SoLA	Incineration	On-site landscaping	On-site disposal (facility)	Dispose of vLLW separately	LLW to national LLWR near Drigg	Treatment and discharge	Discharge	Thermal treatment	Transfer to another site	No. of Options
Metal	✓			✓	✓	✓			$\checkmark$	✓	6
Asbestos						✓			$\checkmark$		2
Aggregate	✓		~	$\checkmark$	$\checkmark$	✓					5
Cellulosic		~		✓	~	~					4
Plastic & Rubber	~	~		✓	✓	✓					5
Soil			✓	✓	✓	✓					4
Water							~	~			2
Organic Liquids	Subject of a previous separate BPEO study, as discussed in Section 5.8.7										
Air	Aerial effluents would be the result of the other waste treatment processes and their consideration in isolation would involve double counting.										

 Table 20
 Summary of Management Options Relevant to Decommissioning LLW

# 5.7 The attributes and scoring scheme

The attributes and scoring schemes applied are outlined in Appendix B in Tables B1 and B2 respectively.

# 5.8 The LLW scores

# 5.8.1 Metal

Six management options were identified for Metal. Detailed raw and weighted scores are contained in Appendix E. A summary of the scores is given in Table 21 below.

	Decontaminate to SoLA	On-site disposal in a purpose built facility	Dispose of vLLW separately in a national facility	Dispose to national LLWR near Drigg	Thermal treatment	Transfer to another site for processing and return to Chapelcross
Overall unweighted total	138	123	111	129	114	118
No. of 5s	4	5	0	1	0	0
No. of 0s	0	0	0	0	0	0
Overall team weighted total	181	155	148	171	148	154
Overall technology weighted total	128	113	108	121	108	111
Overall environmental weighted total	134	122	107	120	111	114
Overall financial weighted total	56	46	48	50	49	49

Table 21 Scoring for LLW Metal Waste Treatment options

Decontamination to SoLA received the highest unweighted score. This option received the highest overall score for each of the attribute headings, although it received one fewer maximum scores than the on-site disposal option. The attributes for which SoLA decontamination option scored the maximum were: public and worker non-radiation accident risks, the proximity principle; and consistency with site end state. This option scored most favourably under the environmental objectives and technical attributes. This is a result of the fact that decontamination acts to reduce the volume of waste for disposal and the level of off-site transport. In addition, it is based on proven processes with sufficient capacity to deal with waste arisings, due to its direct dependence on workforce availability.

The decontamination option was also the highest scoring option under each of the weighting schemes.

#### 5.8.2 Asbestos

Two management options were identified for asbestos. Detailed raw and weighted scores are contained in Appendix E. A summary of the scores is given in Table 22 below.

	Dispose to National LLWR near Drigg	Thermal treatment followed bys disposal to non-hazardous landfill
Overall unweighted total	114	111
No. of 5s	0	0
No. of 0s	0	0
Overall team weighted total	156	139
Overall technology weighted total	116	104
Overall environmental weighted total	106	108
Overall financial weighted total	53	41

Table 22 Scoring for LLW Asbestos Waste Treatment Options

Both options – disposal at the national LLWR and thermal treatment and disposal of the product at a hazardous landfill – received very similar unweighted scores. The thermal treatment option received higher relative scores for attributes related to environmental objectives but lower scores for the financial attributes. The environmental objectives of particular note are waste volume, hazard reduction and the proximity principle. The financial scoring is a reflection of the fact that thermal treatment would be significantly more expensive than disposal at the LLWR, and would also require accelerated expenditure compared to the LTP.

Disposal at the LLWR was the higher scoring option under the team, technology and financial weighting schemes. The team weighted scores are a combined result of the greater weight given to technical, regulatory and financial issues, as compared to the unweighted scores. The relatively unproven nature of the high temperature process results in relatively low scores under the technical heading (for attributes for maturity of technology and scheduling variance to LTP). The possibility of such uncertainties influencing regulatory acceptance is also reflected in the regulatory issues attribute. The greater weighting applied to financial endpoints places a greater weight on the higher cost of the thermal treatment – giving it a lower overall score.

# 5.8.3 Aggregate

Five management options were identified for aggregate. Detailed raw and weighted scores are contained in Appendix E. A summary of the scores is given in Table 23 below.

	Decontaminate to SoLA	On-site landscaping	On-site disposal in a purpose built facility	Dispose of vLLW separately to a national facility	Dispose to National LLWR near Drigg
Overall unweighted total	116	119	126	112	110
No. of 5s	0	3	4	1	1
No. of 0s	0	1	0	0	0
Overall team weighted total	157	148	161	153	150
Overall technology weighted total	115	109	117	114	110
Overall environmental weighted total	112	121	124	102	104
Overall financial weighted total	53	51	52	49	46

Table 23 Scoring for LLW Aggregate Waste Treatment Options

The option that received the highest overall unweighted score was on-site disposal in a purpose-built facility. This option also received the the highest number of maximum scores (5s). These scores relate to the following attributes: routine doses to members of the public; concentrate and contain; the proximity principle and the continued availability of the option. These scores reflect the fact that: the containment assumed to be a design feature of an on-site facility would lead to low public doses; the on-site location would not require transportation of waste off-site: and the location would also allow the site relatively complete control over this disposal route.

The use of LLW aggregate as an on-site landscaping material received the second highest score. However, this option was considered to be unacceptable on the basis that it would be inconsistent with the currently assumed Greenfield site endstate –receiving a zero score for the attribute relating to consistency with end state.

Oon-site disposal in a purpose-built facility was also the highest scoring option under the various weighting schemes, although under the financial weighting scheme the decontamination to SoLA levels received a similar scoring – reflecting the financial outlay required for construction of an on-site facility.

# 5.8.4 Cellulosic

Four management options were identified for cellulosic wastes. Detailed raw and weighted scores are contained in Appendix E. A summary of the scores is given in Table 24 below.

	Incineration	On-site disposal in a purpose built facility	Dispose of vLLW separately to a national facility	Dispose to National LLWR near Drigg
Overall unweighted total	109	118	103	112
No. of 5s	0	2	0	2
No. of 0s	0	0	0	0
Overall team weighted total	145	150	136	152
Overall technology weighted total	106	107	101	106
Overall environmental weighted total	100	118	94	105
Overall financial weighted total	49	45	47	47

Table 24 Scoring for LLW Cellulosic Waste Treatment Options

The option receiving the highest overall unweighted score was on-site disposal in a purpose built facility. This scoring was the primarily the result of high scores under the headings related to human health and safety and environmental impacts. The maximum scores received (for transport and proximity principle) for on-site disposal both relate to the on-site location of the site and consequent reduction in transportation of waste materials.

The on-site disposal option also received one of the highest scores under the various weighting schemes with the exception of the overall financial weighting schemes where all other options scored better – this is a reflection of the significant financial outlay required to build an on-site facility. Under the team weighting scheme, the disposal to the national LLWR received a similar overall score to the on-site disposal option. This is primarily due to the relatively greater weighting given to regulatory issues in the team weighting. Disposal at the LLWR is an established authorised process while the on-site facility would require mew regulatory consents for construction and operation to be established. The option related to disposal at the LLWR also receives one of the highest scores under the technology weighting; the relative scores under this category reflect the fact that the on-site facility is not currently available and that it would imply a continuing on-site liability to the NDA.

#### 5.8.5 Plastic and Rubber

Five management options were identified for plastic and rubber. Detailed raw and weighted scores are contained in Appendix E. A summary of the scores is given in Table 25 below.

	Decontaminate to SoLA	Incineration	On-site disposal in a purpose built facility	Dispose of vLLW to a national facility	Dispose to national LLWR near Drigg
Overall unweighted total	122	107	110	102	108
No. of 5s	3	1	3	0	0
No. of 0s	0	0	0	0	0
Overall team weighted total	158	135	139	137	144
Overall technology weighted total	113	103	101	97	107
Overall environmental weighted total	118	98	108	100	97
Overall financial weighted total	53	47	44	47	46

 Table 25
 Scoring for LLW Plastic and Rubber Waste Treatment Options

The option receiving the highest overall unweighted score was decontamination to SoLA. This option received the highest scores under each of the following headings: human health and safety, environmental impact and objectives and financial costs. This option received 3 maximum scores for: nuisance, waste hierarchy and hazard reduction – this scoring reflects the fact that the decontamination option does not involve significant noise or dust or off-site transport and that it acts to remove the hazard into another waste stream, thus allowing materials to be reused.

The decontamination to SoLA option remains the highest scoring option under each of the weighting schemes.

#### 5.8.6 Water

Two management options were identified for water or liquid aqueous wastes. Detailed raw and weighted scores are contained in Appendix E. A summary of the scores is given in Table 26 below.

The option receiving the highest overall unweighted score is discharge without additional treatment. This option also received the greater number of maximum scores.

The greatest difference in scores between the two options arises under the technical heading, as a result of the higher scores assigned to discharge without treatment for the following technical attributes: availability of the option; scheduling variance and discharge of NDA liabilities. This is a result of the time-element implicit in the scoring criteria for these attributes and the fact that the option to discharge following treatment would necessitate the construction and operation of a new liquid effluent treatment plant and consequently scores relatively poorly.

	Treatment and discharge	Discharge without treatment
Overall unweighted total	124	132
No. of 5s	6	9
No. of 0s	0	0
Overall team weighted total	172	187
Overall technology weighted total	122	141
Overall environmental weighted total	124	124
Overall financial weighted total	46	53

#### Table 26 Scoring for Contaminated Water Waste Options

The option without treatment receives higher scores for all groups of attributes except those under the environmental objectives heading, where the option that includes treatment receives higher scores for attributes related to hazard reduction and the concentrate and contain principles. The scores for environmental impacts are similar for the two options.

Discharge without treatment remains the higher option under each of the weighting schemes, although under environmental weighting the two options are receive similar scores.

#### 5.8.7 Organic Liquids

This was the subject of a separate BPEO study, undertaken by NNC in 2005 [NNC, 2005]. The best performing options identified were as follows:

- Off-site incineration;
- On-site incineration.

# 5.9 The highest unweighted scoring options for LLW

A summary of the highest unweighted scores for LLW is shown in Table 27.

LLW group	Highest scoring option
Metal	Decontaminate to SoLA levels
Asbestos	Disposal at the national LLWR near Drigg
Aggregate	On-site disposal in a purpose-built facility
Cellulosic	On-site disposal in a purpose built facility
Plastic and rubber	Decontaminate to SoLA levels
Contaminated waste water	Discharge without treatment
Organic liquids	Off-site disposal by incineration (from previous specific BPEO study).

#### Table 27 The highest unweighted scoring options for LLW

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It is important to consider this summary information in context; in some cases a relatively small number of options was considered and the differences between the scores may not be significant.

#### 6. SUMMARY

This report records the methodology and results of a study carried out to support the identification of appropriate management options for wastes arising during the 'care and maintenance' phase of decommissioning activities at Chapelcross Power Station.

Two main waste categories were considered

- Intermediate level radioactive waste.
- Low level radioactive waste;

The study applied a Best Practicable Environmental Option (BPEO) methodology to evaluate management options. The approach was designed to make use of currently readily available information, including the technical expertise and site knowledge of BNG staff, within the relatively limited time available for this work. This report presents the results of the study. The approach taken is consistent with the environment agencies guidance on the application of BPEO to radioactive waste management issues.

A number of treatment options were identified for specific types of waste in each waste category.

The treatment options were screened for compliance with UK law and international conventions where clearly defined and consistency with UK policy where clearly defined. The remaining options were then scored against a series of attributes in the following groups:

- Health and safety
- Environmental impacts
- Environmental objectives
- Technical performance
- Socio-economic
- Financial cost

Scoring of the options against the attributes was undertaken by a two stage process that involved: (1) individual scoring by British Nuclear Group staff and collation and consolidation of individual scores to produce group scores, followed by (2) collective discussion at an internal 'round-table' forum of staff, with relevant technical expertise and site knowledge. These processes were facilitated by independent consultants.

The unweighted scores were then weighted on the basis of four different schemes to test the robustness of the outcomes. The four different weighting schemes were devised to test the outcome if an emphasis was put on such factors as costs and the environment. The highest scoring options for each waste group are as provided in the following table.

Waste category	Waste group	Highest scoring option
ILW	Metals	Conditioning and interim storage
	Ceramics	Conditioning and interim storage or Disposal at Sellafield
	Sludges	Conditioning and interim storage
	Resins	Conditioning and interim storage
	Aggregate	Conditioning and interim storage
	Magnox and graphite	Conditioning and interim storage or Disposal at Sellafield
	Desiccants	Conditioning and interim storage
	Oils and oily wastes	Conditioning and interim storage
LLW	Metal	Decontaminate to SoLA levels
	Asbestos	Disposal at the national LLWR near Drigg
	Aggregate	On-site disposal in a purpose-built facility
	Cellulosic	On-site disposal in a purpose built facility
	Plastic and rubber	Decontaminate to SoLA levels
	Contaminated waste water	Discharge without treatment
	Organic liquids	Off-site disposal by incineration (from previous specific BPEO study).

#### Table 28 Highest Scoring Options

It is important to consider this summary information in context; in some cases a relatively small number of options was considered and the differences between the scores may not be significant.



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# APPENDICES

# APPENDIX A. OPTIONEERING WORKSHOPS ATTENDEES

Name	Organisation
Walter Kennedy	British Nuclear Group Chapelcross
Philip Jones	British Nuclear Group Chapelcross
Bob Millard	British Nuclear Group Chapelcross
John MacInnes	British Nuclear Group Chapelcross
Anne Marie Gemmell	British Nuclear Group Chapelcross

The workshop was facilitated by Enviros Consulting Ltd.

# APPENDIX B. MASTER LIST OF ATTRIBUTES AND SCORING SCHEME

Attribute group and attribute	Sub-attribute
Human health and safety:	
1. Public health and safety (individuals)	<ul><li>1.1 Routine radiation doses</li><li>1.2 Radiological accident risks</li><li>1.3 Non-radioactive hazards and risks</li></ul>
2. Public health and safety (societal collective dose)	2.1 Routine radiation doses
3. Worker health and safety (individuals)	<ul><li>3.1 Routine radiation doses</li><li>3.2 Radiological accident risks</li><li>3.3 Non-radioactive hazards and risks</li></ul>
Environmental impact:	
4. Physical environment	<ul> <li>4.1 Air quality</li> <li>4.2 Water quality of receiving body</li> <li>4.3 Land quality</li> <li>4.4 Visual impact</li> <li>4.5 Nuisances (noise, light, dust, etc)</li> <li>4.6 Use of natural resources</li> <li>4.7 Transport</li> </ul>
5. Flora and fauna	5.1 Preservation of ecosystems
Environmental objectives:	
6. Environmental objectives	<ul> <li>6.1 Waste volumes</li> <li>6.2 Waste hierarchy</li> <li>6.3 Hazard reduction</li> <li>6.4 Concentrate and contain</li> <li>6.5 Generation of secondary wastes</li> <li>6.6 Greenhouse gas emissions</li> <li>6.7 Proximity principle</li> </ul>
Technical:	
7. Viability	<ul><li>7.1 Maturity of technology</li><li>7.2 Continued availability of option</li><li>7.3 Throughput/capacity of option</li></ul>
8. Nuclear safety	8.1 Likelihood of meeting CfA
9. Flexibility	9.1 Foreclosing of options
10. Programme	<ul> <li>10.1 Scheduling variance compared to LTP</li> <li>10.2 Minimising project risk to NDA</li> <li>10.3 Discharge of NDA liabilities</li> <li>10.4 Consistency with site end state</li> </ul>
Socio-economic:	

#### Table B1. Master list of Attributes

Attribute group and attribute	Sub-attribute
11. Local community	11.1 Economic impacts 11.2 Culture and heritage
Regulatory issues:	
12. Acceptability	12.1 Likelihood of gaining regulatory acceptance
Financial cost:	
13. Overall cost	<ul><li>13.1 Total undiscounted cost</li><li>13.2 Rate of spend compared to LTP</li><li>13.3 Stability of cost estimates</li></ul>

# Table B2. Scoring Scheme

Attribute/ sub- attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)
Human health and sa	afety	
1. Public health and s	afety (individuals)	
1.1 Routine radiation doses	Difficult to demonstrate doses <1 mSv y <sup>-1</sup> (Basic Safety Limit – BSL)	Easy to demonstrate doses <10 μSvyr <sup>-1</sup> ('below regulatory concern')
1.2 Radiological accident consequences	Unacceptably high consequence	Low consequence
1.3 Non-radioactive hazards and risks	Difficult to demonstrate risk <10 <sup>-4</sup> yr <sup>-1</sup>	Easy to demonstrate risk <10 <sup>-</sup> <sup>6</sup> yr <sup>-1</sup> ('below regulatory concern')
2. Public health and s	afety (societal collective dose)	
2.1 Routine radiation doses	Difficult to demonstrate doses <100 person Sv	Easy to demonstrate doses <1 person Sv
3. Worker health and	safety (individuals)	
3.1 Routine radiation doses	Difficult to demonstrate doses <20 mSv y <sup>-1</sup> (Basic Safety Limit – BSL)	Easy to demonstrate doses <2 mSv y <sup>-1</sup> (Basic Safety Objective – BSO)
3.2 Radiological accident consequences	Unacceptably high consequence	Low consequence
3.3 Non-radioactive hazards and risks	Difficult to demonstrate risk <10 <sup>-3</sup> yr <sup>-1</sup> (largest tolerated risk where activity is crucial for society and economy)	Easy to demonstrate risk <10 <sup>-5</sup> yr <sup>-</sup> (consistent with typical 'safe' practice in non nuclear industry)
Environmental Impa	ct	
4. Physical environme	ent	
4.1 Air quality	Persistent objectionable substances in air in buildings off site	No discernible reduction in air quality
4.2 Water quality	Sterilisation of water resource off site or affects ability to reach site end-point	No discernible reduction in water quality
4.3 Land quality	Sterilisation of substantial area of land off site or affects ability to reach site end-point	No discernible reduction in land quality
4.4 Visual impact	Construction completely out of keeping with existing landscape	No discernible visual impact
4.5 Nuisances (noise, light, dust etc)	Long-term disturbance/disruption of local life	No outward signs of the material management scheme
4.6 Use of natural resources	Unacceptably high use of resources and practice not sustainable	Limited use of resources and managed in a sustainable way
4.7 Transport	Unacceptably high increase in off	No increase in off site

Attribute/ sub- attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)
	site transport operations	transport operations
5. Flora and fauna		
5.1 Preservation of ecosystems	Complete loss of natural ecosystem	No discernible reduction in quality of the natural ecosystem
Environmental object	tives	
6. Environmental obje	ectives	
6.1 Waste volume	Unacceptably high volumes of waste generated	Lowest volumes of waste generated
6.2 Waste hierarchy	Inconsistent with waste hierarchy and no material is reused or recycled, and there is no possibility that it ever can be	Consistent with waste hierarchy and all material is reused or recycled, and none disposed
6.3 Hazard reduction rate	No reduction in hazard or hazard is increased over the long term	Hazards associated with the materials are reduced to a minimum, as rapidly as feasible
6.4 Concentrate and contain	Activity is dispersed to the wider environment and no long remains under engineering or management control	Activity is contained by passive engineered systems, and remains under management controls
6.5 Generation of secondary wastes	Large amounts of secondary waste produced far in excess of original waste volume	Limited secondary waste produced
Technical		
7. Viability		
7.1 Maturity of technology	Unproven and not achievable with existing technology in timescale of LCBL	Established approach, with good track record and applied under similar circumstances.
7.2 Continued availability of option	Not existing on site and could not be procured in timescale of LCBL	Existing on site and is available
7.3 Throughput/capacity of option	Throughput or capacity is very low sufficient to affect LTP	Throughput or capacity meets or exceeds demand and results in no impact on LTP
8. Nuclear safety		
8.1 Likelihood of meeting CfA	Significant dialogue required to gain approval	Demonstrable precedent exists
9. Flexibility		
9.1 Foreclosing of options	Once implemented, no possibility for reversible steps or retrieval of material	Flexible option that allows for reversibility and easy retrieval of material
10. Programme		
10.1 Scheduling variance compared to LTP	Would cause substantial delays to activities on site that lie on critical path, causing failure to meet final LTP objectives and timescales	Can be achieved independently of other activities on site and without impacting on the timing and ordering of other activities

Attribute/ sub- attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)
10.2 Minimising project risk to NDA	Significant project risk to NDA	No additional project risk to NDA
10.3 Discharge of NDA liabilities	NDA liabilities increase in scale or in time	NDA liabilities significantly reduced in scale or period of liabilities significantly shortened
10.4 Consistency with site end state	Completely consistent with defined site end state	Consistent with defined site end state
Socio-economic		
11. Local community		
11.1 Economic impacts	Collapse of local economy	Major enhancement to the local economy [NB Score of 3 = no change]
11.2 Culture and heritage	Collapse of local community through depopulation	Major enhancement of local community [NB Score of 3 = no change]
Regulatory Issues		
12 Regulatory issues		
12.1 Likelihood of gaining regulatory acceptance	Significant dialogue required to gain approval	Demonstrable precedent exists
Financial Cost		
13. Overall cost		
13.1 Total undiscounted cost	Significant undiscounted cost above LTP cost estimates	Significant undiscounted cost below LTP cost estimates [NB Score of 3 = no change for current LTP cost estimates]
13.2 Rate of spend compared to LTP	Significantly increased cash flow forecast compared to current LTP estimates	Significantly decreased cash flow forecast compared to current LTP estimates [NB Score of 3 = no change]
13.3 Stability of cost estimates	Cost estimates highly unstable	Cost estimates highly stable

# APPENDIX C. SCORING WORKSHOPS ATTENDEES

Name	Organisation
Walter Kennedy	British Nuclear Group Chapelcross
Philip Jones	British Nuclear Group Chapelcross
Bob Millard	British Nuclear Group Chapelcross
Norman McMurray	British Nuclear Group Chapelcross

The workshop was facilitated by Enviros Consulting Ltd.

# APPENDIX D. ILW SCORES

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Attributes	Sub-attributes	ž	/ኛ	/ଫ	Scoring Notes
	-				
Group 1: Human health and					
	1.1 Routine radiation doses		3	4	
	1.2 Rad accident risks		3	4	
	1.3 Non-rad hazards and risks		4	4	
2. Public H&S collective	2.1 Routine radiation doses		3	4	
3. Worker H&S individuals	3.1 Routine radiation doses		3	3	
	3.2 Rad accident risks		3	3	
	3.3 Non-rad hazards and risks		3	3	
	Totals		22	25	
		7		-	
		·			
Group 2: Environmental imp	act				
	4.1 Air quality		3	4	
	4.1 Air quality 4.2 Water quality		2	4	<u> </u>
					<u> </u>
	4.3 Land quality		3	3	
	4.4 Visual impact		4	3	
	4.5 Nuisance		3	3	
	4.6 Use of natural resources		3	3	
	4.7 Transport		3	3	
5. Flora and fauna	5.1 Preservation of ecosystems		4	3	
	Totals		25	25	
		8			
Group 3: Environmental obj	ectives			İ	
					Decontamination has the potential to reduce volume; conditioning
6. Environmental objectives	6.1 Waste volume		4	2	and storage leads to overall increase.
	6.2 Waste hierarchy		1	1	
	6.3 Hazard reduction		4	3	
			-	3	Decontamination has potential to concentrate (depending on
			•	•	method) but not necessarily contain. Conditioning and storage
	6.4 Concentrate and contain		3	3	contains but does not concentrate.
	6.5 Generation of secondary wastes		2	4	
	6.6 Greenhouse gas emmissions		3	4	
	6.7 Proximity principle		3	4	
	Totals		20	21	
		7			
Group 4: Technical					
	7.1 Maturity of technology		3	3	
	7.2 Continued availability of option		3	4	
	7.3 Throughput/capacity of option		3	3	
	8.1 Likelihood of meeting CFA		3	3	
	10.1 Scheduling variance compared to LTP		3	3	
	10.2 Minimising project risk to NDA		3	3	
	TU.2 Millimising project risk to NDA		3	3	
					Dependentiation has the notantial to reduce the littless Question
				_	Decontamination has the potential to reduce liabilities; Conditioning
	10.3 Discharge of NDA liabilities		4	3	and interim storage results in liabilities remaining on site.
ļ	10.4 Consistency with site End State		3	4	
L	Totals		25	26	
L		8			
Group 5: Socio-economic					
111   000  0	11.1 Economic impacts		3	3	
			3	3	
	11.2 Culture and heritage		•	<u>^</u>	
	11.2 Culture and heritage Totals		6	6	1
		2	6	0	
		2	6	0	
Group 6: Regulatory issues	Totals	2		0 4	
Group 6: Regulatory issues	Totals 12.1 Likelihood of gaining regulatory acceptance	2	3	4	
Group 6: Regulatory issues	Totals				
Group 6: Regulatory issues	Totals 12.1 Likelihood of gaining regulatory acceptance	2	3	4	
Group 6: Regulatory issues 12. Acceptability	Totals 12.1 Likelihood of gaining regulatory acceptance		3	4	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial	Totals 12.1 Likelihood of gaining regulatory acceptance Totals		3 3	4 4	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost		3 3 3	4 4	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP		3 3 3 3 3	4 4 3 3	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates		3 3 3 3 3 2	4 4 3 3 3	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP	1	3 3 3 3 3	4 4 3 3	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates		3 3 3 3 3 2	4 4 3 3 3	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals         12.1 Likelihood of gaining regulatory acceptance         Totals         13.1 Total undiscounted cost         13.2 Rate of spend compared to LTP         13.3 Stability of cost estimates         Totals	1	3 3 3 3 2 8	4 4 3 3 3 9	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates	1	3 3 3 3 3 2	4 4 3 3 3	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals         12.1 Likelihood of gaining regulatory acceptance         Totals         13.1 Total undiscounted cost         13.2 Rate of spend compared to LTP         13.3 Stability of cost estimates         Totals         Total Less Group 7 scores	1	3 3 3 2 8 101	4 4 3 3 3 9 9	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals         12.1 Likelihood of gaining regulatory acceptance         Totals         13.1 Total undiscounted cost         13.2 Rate of spend compared to LTP         13.3 Stability of cost estimates         Totals	1	3 3 3 3 2 8	4 4 3 3 3 9	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals Total less Group 7 scores Overall Total	1	3 3 3 3 2 8 101 109	4 4 3 3 3 9 107 116	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals Total less Group 7 scores Overall Total No. of 5s	1	3 3 3 2 8 101 109 0	4 4 3 3 3 9 9 107 116 0	
Group 6: Regulatory issues 12. Acceptability Group 7: Financial 13. Financial cost	Totals 12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals Total less Group 7 scores Overall Total	1	3 3 3 3 2 8 101 109	4 4 3 3 3 9 107 116	

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	120	/ 20'	/ ବଁଁ	/ c <sup>o</sup> `	/
UNWEIGHTED			<u> </u>	<u> </u>	
Group 1: Human health and safety	1	7	22	25	
Group 2: Environmental impact	1	8	25	25	
Group 3: Environmental objectives	1	7	20	21	
Group 4: Technical	1	8	25	26	
Group 5: Socio-economic	1	2	6	6	
Group 6: Regulatory	1	1	3	4	
Group 7: Financial	1	3	8	9	
Overall unweighted total			109	116	
TEAM WEIGHT					
Group 1: Human health and safety	10	7	31	36	
Group 2: Environmental impact	10	8	31	31	
Group 3: Environmental objectives	5	7	14	15	
Group 4: Technical	8	8	25	26	
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	5	1	15	20	
Group 7: Financial	8	3	21	24	
Overall team weighted total			141	155	
TECHNOLOGY WEIGHT					
Group 1: Human health and safety	10	7	31	36	
Group 2: Environmental impact	1	8	3	3	
Group 3: Environmental objectives	1	7	3	3	
Group 4: Technical	10	8	31	33	
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	1	1	3	4	
Group 7: Financial	10	3	27	30	
Overall technology weighted total			101	111	
ENVIRONMENTAL WEIGHT					
Group 1: Human health and safety	10	7	31	36	
Group 2: Environmental impact	10	8	31	31	
Group 3: Environmental objectives	10	7	29	30	
Group 4: Technical	1	8	3	3	
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	1	1	3	4	
Group 7: Financial	1	3	3	3	
Overall environmental weighted total			103	110	
FINANCIAL WEIGHT	<u> </u>				
Group 1: Human health and safety	1	7	3	4	
Group 2: Environmental impact	1	8	3	3	
Group 3: Environmental objectives	1	7	3	3	
Group 4: Technical	1	8	3	3	
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	1	1	3	4	
Group 7: Financial	10	3	27	30	
Overall financial weighted total			45	50	

4.3 Land quality       3       3       issue.         4.4 Visual impact       3       3       4         4.5 Nuisance       3       3       4         4.6 Use of natural resources       3       3       4         4.7 Transport       4       2       2         5. Flora and fauna       5.1 Preservation of ecosystems       3       3       3         7       7       7       25       23       26         6. Flora and fauna       5.1 Preservation of ecosystems       3       3       3         6. Environmental objectives       6       -       -       -         6. Environmental objectives       1       1       1       All disposal options - score similarly.         6. Environmental objectives       -       -       -       -       -         6. Environmental objectives       1       1       1       All disposal options - score similarly.         6. Environmental objectives       -       -       -       -       -         6.4 Concentrate and contain       3       3       3       -       -       -         6.6 Greenation of secondary wastes       3       3       3       3       -       -	<b>F</b>		1			,	/ /
Group 1: Human health and selety         Image: health and selety         Image: health and selety           Public 145 information for matching from seletion doses         4         3         3           Public 145 information for matching from seletion doses         4         4         3         3           State and the formation for matching from seletion doses         3         4         4         3         3           3. Worker 145 individual         3.1 Register relation doses         3         4         4         3         3           3. Worker 145 individual         3.1 Register relation doses         7         4         3         3           4. Physical environment input:         7         2         2         3         4           4. Physical environment input:         3         3         4         4         4         4           4. Physical environment input:         3         3         3         4         4         4         4         4           6 Up of instrum relation doses         3         3         3         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4			ibutes	/	d initial and a second	in the second second	Double to a second seco
Group 1: Human health and selety         Image: Constraint of the cons			attr		§ / 2	\$ / <b>\$</b>	· /
Group 1: Human health and selety         Image: Constraint of the cons			å	jor (jior		/ &	
Group 1: Human health and selver 1 Abid 1 M5 micro marketion does         Image: Constraint of the selver rates 1 Abid M5 micro marketion does         Image: Constraint of the selver rates 1 Abid M5 micro marketion does           2. Poils 1455 control 2 14 hours marketion does         3         4         4         3         3           3. Worker 155 Individual 3. Divon an inaction and does         4         4         3         3           3. Worker 155 Individual 3. Divon an inaction and does         7         4         4         3         3           4. Physical environment input         7         4         3         3         4         4           4. Physical environment input         7         4         3         3         4         4           4. Physical environment input         1         7         3         3         4         4           4. Physical environment input         1         3         3         4         4         4           4. Physical environment input         1         3         3         4         4         4           6. Environment input         1         3         3         3         4         4           6. Environment input         1         3         3         3         3         3			S.	No.	25	2°	
Group 1: Human health and selety         Image: Constraint of the cons	Attributes	Sub-attributes	Ŷ	/ଙ	120	10	Scoring Notes
IP-Bic SS inviscant         IP Bat residue does         4         3         3           2 Pada color risks         4         4         3         3           2 Pada color risks         4         4         3         3           3 Worker HSS columes         31 Normal names for risks         4         4         3         3           3 Worker HSS columes         31 Normal names for risks         4         4         3         4           3 Worker HSS middlew         32 Normal names for risks         4         3         4         3           9 Orga 2: Environmental inspect         1         7         4         3         3         4           1 /P prodice invironmental inspect         3         3         4         3         3         4           1 /P prodice invironmental inspect         3         3         4         3         3         4           1 /P prodice invironmental inspect         3         3         4         3         3         4           1 /P prodice invironmental inspect         3         3         4         3         3         4           1 /P prodice invironmental inspect         3         3         3         4         3         3							
Image: Point HS contained and head head head head head head head hea							
Image: Solution of Solution Solutin Solutin Solution Solution Solution Solution Solution Solution	1. Public H&S individuals						
2. Public Naise         1. Routine radiation does         4         3         3           3. Worker HSS individus         3.1 Routine radiation does         4         4         3           3. Worker HSS individus         3.1 Routine radiation does         4         4         3           3.1 Stormatin and toxics and does         4         4         3         4           3.1 Stormatin taxets and does         6         2         2         2           1.1 Marganity         7         7         7         7           4.2 Water HSS individus         3         3         4           1.1 Marganity         2         3         3         4           1.2 Water HSS individus         2         3         3         4           1.2 Water HSS individus         2         3         3         4           1.1 Water HSS individus         2         3         3         4           1.1 Stormatine HSS individus         2         3         3         4           1.1 Stormatine HSS individus         2         3         3         4           1.1 Stormatine HSS individus         3         3         3         4           1.1 Store HSS individus         3         3			_				
3. Worker HSS individuals         3.1 Routine radiation closes         3         4         4           3.2 Fad colored trials         7         4         3         4           1.3 Non-radius and trials         7         4         2         3           6         Fording         7         4         2         2           Forup 2: Environmental larget         7         4         2         3         4           1. Physical environment         1.2 Wingr quality         3         3         4           4.1 Visual impact         3         3         4         No         Forup close - similarity in waste volume, locs           4.3 Visual impact         3         3         4         4         4         4           4.4 Visual impact         3         3         4         4         4         4         4           4.3 Visual impact         3         3         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4           4.5 Stand in this inclust         3         3         3         4         4         4         4	2 Public H&S collective		-				
3 2 Rad accident roks         3 3         4         3 3         4           3.3 Worked hazends and roks         7 60         2         23         23           Group 2: Environmental impact         7         7         7         7           4. Physical environmental impact         3         3         4         3           4. Physical environmental impact         3         3         4         3         3           4. Physical environmental impact         3         3         3         3         3           4. A Visual impact         3         3         3         3         3         3           6. Solve of natural resources         3         3         3         3         3         3           6. Pora and faum         7. Prosended not ecosystems         3         3         3         3         3           6. Comp 3. Environmental objectives         6.1 Wate volume         7         3         3         3         3           6. Comp 3. Environmental objectives         6.1 Wate volume         3         3         3         3         3           6. Gome 3. Environmental objectives         6.1 Wate volume         3         3         3         3         3         3<							
3.3 Non-rad hazards and risks         4         3         3           Ford         26         27         27           Group 2: Environmental Impact         1         7         7         7           4.9 Physical environment         1.1 Ar gualty         3         3         4           4.9 Physical environment         4.1 Ar gualty         3         3         4           4.1 Migra gualty         3         3         4         4           4.1 Migra gualty         3         3         3         4           4.4 Visual impact         3         3         3         4           4.4 Visual impact         3         3         3         4           4.6 List of ratial resources         4         3         3         3           5. Fora and fauna         5.1 Presenation of ecosystems         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1							
Totals         7         7         7           Group 2: Environmental Impact         7         7         7         7           4: Pryscal anvironmental Properties         1         3         3         4           4: Pryscal anvironmental Properties         3         3         4           4: A rotabily         3         3         4           4: A formation properties         3         3         4           4: A formation properties         3         3         4           4: A formation properties         4         2         2           6: Environmental objectives         4         2         2           6: Environmental objectives         1         3         3           6: Environmental objectives         1         3         3           6: Environmental objectives         1         1         3         3           6: Contractive and contrate contrate and contrate and contrate and contrate contra			İ.				
4. Physical environment         1.1 Art quality         3         3         4           4. Wate quality         3         3         3         No differentiation between options - similarity in waste volume, local decimants of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the s				26			
4. Physical environment         1.1 Art quality         3         3         4           4. Wate quality         3         3         3         No differentiation between options - similarity in waste volume, local decimants of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the s			7				
4. Physical environment         1.1 Art quality         3         3         4           4. Wate quality         3         3         3         No differentiation between options - similarity in waste volume, local decimants of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the s							
4.2 Water quality         13         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4							
A 3 Land quality         B         No differentiation between options - similarity in waste volume, local association of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second seco	4. Physical environment		ĻП				
4.3 Land quality       3       3       3       3       4         4.4 Stata impact       3       3       4       4         4.4 G bas of ratural resources       3       3       4         5. Fors and fauna       1       7       7       7         5. Fors and fauna       1       7       8       2       3       3         6. Forvionmental objectives       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1		4.2 Water quality		3	3	3	
4.4 Yasal impact         3         3         4           4.5 Nukance         3         3         4           4.6 Use of natural resources         3         3         4           5. Flora and fauna         5. I Preservation of ecosystems         4         7         2         3         3         4           6. Environmental objectives         8         2         2         2         2         2           6. Environmental objectives         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1		4.0 Land available	1	_			No differentiation between options - similarity in waste volume, location not
4.5 Nuisancé         3         3         3         3           4.6 Uso ratural resources         3         3         4           5. Fibra and fauna         5. Fibra and fauna         5. Fibra and fauna         7           6. Fibra and fauna         5. Fibra and fauna         8         28         29         28           6. Fibra and fauna         5. Fibra and fauna         8         -         -         -           6. Fibra and fauna         8         -         -         -         -           6. Fibra and fauna         8         -         -         -         -           6. Fibra and fauna         3         3         -         -         -           6. Fibra and fauna         3         3         -         -         -           6. Fibra and fauna         3         3         3         -         -           6. Fibra and contain         3         3         3         3         -           6. S Greenhouse gas enmissions         3         3         3         -         -           7         Folds         70         19         19         -         -           7. S Throunity principite         4         3			$\vdash$	-			ISSUE.
4.6 Use of natural resources         3         3         4           4.7 Transport         4         2         23         26           5. Flora and fauna         5.1 Preservation of acosystems         3         3         3         3           6. Environmental objectives         6         7         7         7         7         7           6. Environmental objectives         6.1 Weste volume         3         3         3         3           6. Environmental objectives         6.1 Weste volume         3         3         3         3           6. A tazard reduction         3         3         3         3         3         3           6. Concentrate and contain         3         3         3         3         3         3           6.2 Occontrate and contain         1         1         1         1         1         All disposal options - score similarly.           6.2 Occontrate and contain         3         3         3         3         3         3           6.3 Occontrate and contain         1         3         3         3         3         3           6.4 Concentrate and contain         1         3         3         3         3         3			$\vdash$				<u> </u>
4.7 Transport         4         2         2           Flora and fauna         5.1 Preservation of coxystems         25         23         26           Flora and fauna         1.1 Preservation of coxystems         8         7         7           Group 3: Environmental objectives         6         7         7         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1			$\vdash$				
5. Flora and fauna         5. I Preservation of ecosystems         3         3         3         3           Group 3: Environmental objectives         6. I Waste volume         2         23         26           6. Environmental objectives         6. I Waste volume         3         3         3         3           6. Environmental objectives         6. I Waste volume         3         3         3         3           6. Environmental objectives         6. I Waste volume         3         3         3         3           6. Concentrate and contain         3         3         3         3         3         3           6. 6. Greentours gas entrinsions         1         3         3         3         3         3           7. Vability         71         7         7         7         7         7           7. Vability         71         Matury of technology         7         3         3         4           7. Vability         7         1         1         3         3         4           7. Vability         7         1         1         3         3         4           7. Vability         7         1         3         3         4         1			$\vdash$				
Totals         25         23         26           Group 3: Environmental objectives         8         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1	5 Elora and fauna						
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6. Environmental objectives       6.1 Waste volume       3       3       3         6. 4. Waste hierarchy       1       1       1       1       All disposal options - score similarly.         6. 3 Hazard reduction       3       3       3       not accept due to H-3 levels).         6. 4 Concentrate and contain       3       3       3       3         6. 6 Creentous gas emmissions       3       3       3       3         6. 7 Proxinity principle       4       3       3       3         7. Vability       7       4       3       3       4         7. Vability       7.1 forwidputcapacity of polion       3       3       4       1         7. Vability       7.1 forwidputcapacity of option       3       3       4       1         7. Vability       7.1 forwidputcapacity of option       3       3       4       1         8. Nuclear Safety       8.1 Likelhood of mediand compared to LTP       3       3       4       1         10. Programme       10.2 Mininising project risk to NDA       3       3       4       1         11. J. All solutions       3       3       4       1       4       3       4         10.2 Consistency			Ŭ				
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6.4 Concentrate and contain         3         3         3         3         3           6.5 Generation of secondary wastes         3         3         3         3         3           6.6 Greenhouse gas emmissions         3         3         3         3         3           6.7 Proximity principle         4         3         3         3         3           7         7         7         7         7         7           Group 4: Technical         7         7         7         7         7           7. Viability         7.1 Maturity of technology         3         3         4         7           7. Viability         7.2 Continued availability of option         3         3         3         4           8. Nuclear Satety         8.1 Likelihood of meeting CFA         3         2         1         No established route for transfer to Sellafield for this waste stream i           10. Programme         10.3 Shechairing avainee compared to LTP         3         3         4         Transfer to Sellafield involves complete removal of liability: transfer           10. Programme         10.4 Consistency with site End State         4         3         4         Gordition and store option.           11. Local commulty         11.1 Eco							Score similiarly - all wastes conditioned and stored (in practice Sellafield will
E.5. Generation of secondary wastes         3         3         3         3         3           6.6. Greenhous gas emmissions         7         4         3         3         -           6.7. Proximity principle         7         19         19         -         -           Group 4: Technical         7         19         -         -         -           7.1. Viability         7.1. Maturity of technology         3         3         3         4           7.2. Continued availability of option         3         3         3         4         -           7.2. ThroughputCapacity of option         3         3         3         -         -         -           8. Nuclear Safety         6.1. Likelihood of meeting CFA         3         2         1         acceptance less likely than transfer to another site.         10. Programme         10.1. Scheduing variance compared to LTP         3         3         4         -           10.2. Minimican project risk to NDA         3         3         4         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -				-			not accept due to H-3 levels).
6.6 Greenhouse gas amissions         3         3         3         3           6.7 Proximity principle         14         3         3           7         7         19         19           Group 4: Technical         7         7         19           7. Vlability         7.1 Maturity of technology         3         3         4           7. Vlability         7.1 Maturity of technology         3         3         4           7. Vlability         7.1 Maturity of technology         3         3         4           7. Vlability         7.1 Maturity of technology         3         3         4           7. Vlability         7.1 Maturity of technology         3         3         4           8. Nuclear Safety         8.1 Likelihood of meeting CFA         3         2         1         acceptance less likely than transfer to Sellafield for this waste stream at the condition and store option.           10.2 Minimising project risk to NDA         3         3         4         transfer to Sellafield involves complete removal of liability: transfer to Sellafield involves complete removal of liability: transfer to Sellafield involves complete removal of liability: transfer to Sellafield involves complete removal of liability: transfer to Sellafield involves complete removal of liability: transfer to Sellafield involves completeremoval of liability: transfer to Sellafield involves co		6.4 Concentrate and contain					
6.7 Proximity principle         4         3         3           Group 4:         Totals         20         19         19           Group 4:         Totals         7         10         19           Group 4:         Totals         7         10         10           Group 4:         Totals         7         10         10         10           7.1 Maturity of technology         3         3         4         Notestablished route for transfer to Seliafield for this waste steam (acceptance)           7.3 Throughput/capacity of option         3         3         3         4           8. Nuclear Safety         8.1 Likelihood of meeting CFA         3         2         1         No established route for transfer to Seliafield for this waste steam (acceptance)           10. Programme         10.1 Scheduling variance compared to LTP         3         3         4           10.2 Minimising project risk to NDA         3         3         4         4         3         3           10.3 Discharge of NDA liabilities         3         3         4         4         3         3         4           10.4 Consistency with site End State         4         3         3         3         3         3         3							
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7.3 Throughput(capacity of option     3     3     4       8. Nuclear Safety     8.1 Likelihood of meeting CFA     3     2     1       10. Programme     10.1 Scheduling variance compared to LTP     3     3     4       10. Programme     10.1 Scheduling variance compared to LTP     3     3     4       10.2 Minimising project risk to NDA     3     3     4       10.3 Discharge of NDA liabilities     3     3     4       10.4 Consistency with site End State     4     3     4       6 roup 5: Socio-economic     11. Local community     11.1 Economic impacts     3     3       11. Local community     11.1 Economic impacts     3     3     3       12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     4       6 roup 5: Regulatory issues     2     4     4       7 rotals     2     6     6       6 roup 5: Regulatory issues     1     4     2       7 rotals     4     2     4       7 rotals     4     2     4       7 rotals     4     2     4       7 rotals     6     6     6       7 rotals     4     2     4       7 rotals     3     3     3<							
B. Nuclear Safety       B. Likelihood of meeting CFA       3       2       No established route for transfer to Sellafield for this waste stream a coceptance less likely than transfer to another site.         10. Programme       10.1 Scheduling variance compared to LTP       3       3       4         10.2 Minimising project risk to NDA       3       3       4         Interview       Transfer to Sellafield involves complete removal of liability: transfer site involves return of material to site after conditioning - equivalent site involves return of material to site after conditioning - equivalent condition and store option.         10.4 Consistency with site End State       4       3       4         Group 5: Socio-economic       8				3	3	4	
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10.4 Consistency with site End State       4       3       4         Totals       25       23       27         8       8       8       8         Group 5: Socio-economic       8       9         11. Local community       11.1 Economic impacts       3       3         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       4         11.       11       11       11       11       11         13. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       4         11.       11       11       11       11       11         13. Financial       13.1 Total undiscounted cost       3       3       3         13.1 Total							site involves return of material to site after conditioning - equivalent to
Totals         25         23         27           Group 5: Socio-economic         8         7         7           11. Local community         11.1 Economic impacts         3         3         3           11. Local community         11.1 Economic impacts         3         3         3           11. Local community         11.1 Economic impacts         3         3         3           11. Local community         11.1 Economic impacts         3         3         3           11. Local community         11.1 Economic impacts         6         6         6           11. Local community         11.1 Economic impacts         6         6         6           11. Culture and heritage         7         7         7         7           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         4           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         1         1         6           13. Financial         13.1 Total undiscounted cost         3         3         3         3           13. Financial cost         13.1 Total undiscounted cost         3         3         3         3           13. Stability of cost estimates         2<				-			condition and store option.
B         B         B           Group 5: Socio-economic         11.1 Economic impacts         3         3         3           11. Local community         11.1 Economic impacts         3         3         3           11.2 Culture and heritage         3         3         3         3           11.2 Culture and heritage         1         6         6         6           2         2         -         -         -         -           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         4         -           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         4         -           13.1 Total undiscounted cost         1         -         -         -         -         -           13.1 Total undiscounted cost         3         3         3         - <td></td> <td></td> <td><math>\vdash</math></td> <td></td> <td></td> <td></td> <td></td>			$\vdash$				
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11. Local community       11.1 Economic impacts       3       3       3         11.2 Culture and heritage       3       3       3         Totals       6       6       6         Group 6: Regulatory issues       2			ŏ	<u> </u>			
11. Local community       11.1 Economic impacts       3       3       3         11.2 Culture and heritage       3       3       3         Totals       6       6       6         Group 6: Regulatory issues       2	Group 5: Socio-economia		$\vdash$	<u> </u>			
11.2 Culture and heritage       3       3       3         Totals       6       6       6         2       2       2       2         Group 6: Regulatory issues       2       4       2         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       4         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       4         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       4         13. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       4         6roup 7: Financial       1       1       1       1         13. Financial cost       13.1 Total undiscounted cost       3       3       3         13. Financial cost       13.1 Total undiscounted cost       3       3       3         13. Stability of cost estimates       2       3       3       3         13.3 Stability of cost estimates       2       3       3       1         14. Otal less Group 7 scores       106       95       105       1         15. Financial       1114       104       114       14       14		11 1 Economic impacts	$\mathbf{H}$	3	3	3	
Totals         6         6         6           Group 6: Regulatory issues         2	The Eoodal Community						
Group 6: Regulatory issues     2							
Group 6: Regulatory issues         1         1           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         4           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         4           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         4           1         Totals         4         2         4           13. Financial         1         1         1           13. Financial cost         13.1 Total undiscounted cost         3         3         3           13. Financial cost         13.1 Total undiscounted cost         3         3         3           13. Financial cost         13.1 Total undiscounted cost         2         3         3           13. Rate of spend compared to LTP         3         3         3         3           13.3 Stability of cost estimates         2         3         3         1           13.3 Stability of cost estimates         106         95         105           14.         114         104         114           14.         114         104         114           15.         0         0         0 <td></td> <td>, other</td> <td></td> <td></td> <td></td> <td>1</td> <td></td>		, other				1	
12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       4         Totals       4       2       4         Image: Colspan="2">Totals       4       2       4         Image: Colspan="2">Totals       4       2       4         Image: Colspan="2">Totals       4       2       4         Image: Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan	Group 6: Regulatory issues		Ľ		L		
Totals     4     2     4       1     1     1       Group 7: Financial     1     1       13. Financial cost     13.1 Total undiscounted cost     3     3       13.2 Rate of spend compared to LTP     3     3     3       13.3 Stability of cost estimates     2     3     3       13. Total less Group 7 scores     106     95     105       13.1 Total less Group 7 scores     106     95     105       13.1 Total less Group 7 scores     106     95     105       13.1 Total less Group 7 scores     106     95     105       13.1 Total less Group 7 scores     106     95     105       13.1 Total less Group 7 scores     106     95     105       13.1 Total less Group 7 scores     106     95     105       13.1 Total less Group 7 scores     106     95     105       13.1 Total less Group 7 scores     106     95     105		12.1 Likelihood of gaining regulatory acceptance				4	
13. Financial cost     13.1 Total undiscounted cost     3     3       13.2 Rate of spend compared to LTP     3     3       13.3 Stability of cost estimates     2     3       Totals     8     9       13.3 Total less Group 7 scores     106       95     105       100     1114       1114     104       114     104				4	2	4	
13. Financial cost     13.1 Total undiscounted cost     3     3       13.2 Rate of spend compared to LTP     3     3       13.3 Stability of cost estimates     2     3       Totals     8     9       13.3 Total less Group 7 scores     106       95     105       100     1114       1114     104       114     104			1				
13. Financial cost     13.1 Total undiscounted cost     3     3       13.2 Rate of spend compared to LTP     3     3       13.3 Stability of cost estimates     2     3       Totals     8     9       13.3 Total less Group 7 scores     106       95     105       100     1114       1114     104       114     104				ļ			
13.2 Rate of spend compared to LTP     3     3     3       13.3 Stability of cost estimates     2     3     3       Totals     8     9     9       3     3     -     -       3     -     -     -       3     -     -     -       100     -     -     -       110     -     -     -       1111     104     114       1111     104     114       1111     -     -       1111     -     -			$\square$		<u> </u>	<u> </u>	
13.3 Stability of cost estimates     2     3     3       Totals     8     9     9       3     3     3     3       Total less Group 7 scores     106     95     105       Overall Total     114     104     114       No. of 5s     0     0	13. Financial cost		$\vdash$				
Totals         8         9         9           3         3         3         3           Total less Group 7 scores         106         95         105           Overall Total         114         104         114           No. of 5s         0         0         0			$\vdash$				
3         3           Total less Group 7 scores         106         95         105           Overall Total         114         104         114           No. of 5s         0         0         0			$\vdash$				<u> </u>
Total less Group 7 scores         106         95         105           Overall Total         114         104         114           No. of 5s         0         0         0		Iotais			9	9	
Overall Total         114         104         114           No. of 5s         0         0         0			3	ł – –	1		4
Overall Total         114         104         114           No. of 5s         0         0         0		Total less Group 7 scores	$\square$	106	95	105	1
No. of 5s 0 0 0		101011035 61000 7 300163	$\square$				1
No. of 5s 0 0 0		Overall Total		114	104	114	1
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No. of 0s 0 0 0				0	0		
		No. of 0s		0	0	0	
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UNWEIGHTED						
Group 1: Human health and safety	1	7	26	22	23	
Group 2: Environmental impact	1	8	25	23	26	
Group 3: Environmental objectives	1	7	20	19	19	
Group 4: Technical	1	8	25	23	27	
Group 5: Socio-economic	1	2	6	6	6	
Group 6: Regulatory	1	1	4	2	4	
Group 7: Financial	1	3	8	9	9	
Overall unweighted total			114	104	114	
TEANAWEIOUT						
TEAM WEIGHT	10	7	27	21	20	
Group 1: Human health and safety	10	7	37	31	33	
Group 2: Environmental impact Group 3: Environmental objectives	10 5	8 7	31 14	29 14	33 14	
Group 4: Technical	2 8	8	25	23	27	
Group 5: Socio-economic	1	2	3	3	3	
Group 6: Regulatory	5	1	20	10	20	
Group 7: Financial	8	3	21	24	24	
Overall team weighted total			152	134	153	
TECHNOLOGY WEIGHT						
Group 1: Human health and safety	10	7	37	31	33	
Group 2: Environmental impact	1	8	3	3	3	
Group 3: Environmental objectives	1	7	3	3	3	
Group 4: Technical	10	8	31	29	34	
Group 5: Socio-economic	1	2	3	3	3	
Group 6: Regulatory	1	1	4	2	4	
Group 7: Financial	10	3	27	30	30	
Overall technology weighted total			108	101	110	
ENVIRONMENTAL WEIGHT	10	7	07	01	00	
Group 1: Human health and safety Group 2: Environmental impact	10 10	7	37	31	33	
Group 2: Environmental Impact Group 3: Environmental objectives	10	8 7	31 29	29 27	33 27	
	10	8	29 3	3	3	
Group 4: Technical Group 5: Socio-economic	1	8	3	3	3	
Group 6: Regulatory	1	1	4	2	4	
Group 7: Financial	1	3	3	3	3	
Overall environmental weighted total		5	110	98	106	
e veran environmentar weigineu total				55	.00	
FINANCIAL WEIGHT		7	4	3	3	
Group 1: Human health and safety	1		2	3	3	
Group 1: Human health and safety Group 2: Environmental impact	1	8	3			
Group 1: Human health and safety		7	3	3	3	
Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical	1 1 1	7 8	3 3	3 3	3	
Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic	1 1 1 1	7	3 3 3	3 3 3		
Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory	1 1 1 1 1	7 8 2 1	3 3 3 4	3 3 3 2	3 3 4	
Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic	1 1 1 1	7 8 2	3 3 3	3 3 3	3 3	

Attributes	Sub-attributes	No. sub-attributes	Conti	Non reaction of the second	Contraction of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second seco	Scoring Notes
						Transfer to another site (Winfrith) involves washing by sea with
Group 1: Human health an	d safety					return of LLW to site.
1. Public H&S individuals	1.1 Routine radiation doses		4	3	3	
	1.2 Rad accident risks		4	3	3	
2. Public H&S collective	1.3 Non-rad hazards and risks 2.1 Routine radiation doses		4	3	3	
3. Worker H&S individuals	3.1 Routine radiation doses		3	4	4	
	3.2 Rad accident risks		3	3	3	
	3.3 Non-rad hazards and risks		4	3	3	
	Totals	7	26	22	23	
		Ĺ				
Group 2: Environmental in				_	_	
<ol> <li>Physical environment</li> </ol>	4.1 Air quality 4.2 Water quality		3	3	3	
	4.3 Land quality	+	3	4	3	No discrimination - similar to ceramics.
	4.4 Visual impact	$\uparrow$	2	3	4	
	4.5 Nuisance		3	3	3	
	4.6 Use of natural resources		2	3	3	
5. Flora and fauna	4.7 Transport 5.1 Preservation of ecosystems	-	4	2	2	
5. FIORA AND RAUNA	5.1 Preservation of ecosystems Totals		4 24	22	22	
	lotaio	8			20	
Group 3: Environmental ol 6. Environmental objectives		_	3	2	2	
6. Environmental objectives	6.2 Waste hierarchy		3 1	3	3	
						Transfer to another site involves hazard reduction - ideally leading to decontamination to LLW; On-site conditioning involves passivation; conditioning at Sellafield prior to disposal
	6.3 Hazard reduction		3	4	2	unknown.
	6.4 Concentrate and contain		3	3	3	
	6.5 Generation of secondary wastes 6.6 Greenhouse gas emmissions		3	2	3	
	0.0 Greenhouse gas emmissions	-	-	5	~	Conditioning and storage - waste remains on site; the other site
	6.7 Proximity principle		4	2	3	(Winfrith) is more distant than Sellafield.
	Totals	-	21	18	17	
Group 4: Technical						
7. Viability	7.1 Maturity of technology		3	3	4	
	7.2 Continued availability of option		4	3	3	
8. Nuclear Safety	7.3 Throughput/capacity of option 8.1 Likelihood of meeting CFA	_	4	2	2	
10. Programme	10.1 Scheduling variance compared to LTP		4	3	3	
loi l'ogrammo	10.2 Minimising project risk to NDA		4	3	3	
	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State		3	4	4	Conditioning and storage - liabilities remain on-site; transfers off-site lead to complete discharge of responsibility (returned LLW from the other site would be disposed of at national LLWR).
	Totals		29	24	25	
		8		<u> </u>		
Group 5: Socio-economic		-				
11. Local community	11.1 Economic impacts		3	3	3	
	11.2 Culture and heritage		3	3	3	
	Totals	_	6	6	6	
Group 6: Regulatory issue		2				
12. Acceptability	12.1 Likelihood of gaining regulatory acceptar	nce	4	2	3	
	Totals		4	2	3	
		1				
Group 7: Financial		+				
13. Financial cost	13.1 Total undiscounted cost	t	3	3	4	
	13.2 Rate of spend compared to LTP		4	2	3	
	13.3 Stability of cost estimates	-	4	3	3	
	Totals	3	11	8	10	
		3				1
	Total less Group 7 scores		110	95	97	]
	Overall Total	1	121	103	107	4
	No. of 5s	-	0	0	0	1
				. ~	. ~	
	No. of 0s		0	0	0	1

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UNWEIGHTED				22		
Group 1: Human health and safety Group 2: Environmental impact	1	7 8	26 24	22	23 23	
Group 3: Environmental objectives	1	7	21	18	17	
Group 4: Technical	1	8	29	24	25	
Group 5: Socio-economic	1	2	6	6	6	
Group 6: Regulatory	1	1	4	2	3	
Group 7: Financial	1	3	11	8	10	
Overall unweighted total			121	103	107	
					$\left  - \right $	
TEAM WEIGHT						
Group 1: Human health and safety	10	7	37	31	33	
Group 2: Environmental impact	10	8	30	29	29	
Group 3: Environmental objectives	5	7	15	13	12	
Group 4: Technical	8	8	29	24	25	
Group 5: Socio-economic Group 6: Regulatory	5	2	3 20	3 10	3 15	
Group 7: Financial	8	3	20	21	27	
Overall team weighted total	<u> </u>	0	163	131	143	
-						
TECHNOLOGY WEIGHT						
Group 1: Human health and safety	10	7	37	31	33	
Group 2: Environmental impact	1	8	3	3	3	
Group 3: Environmental objectives	1	7	3	3	2	
Group 4: Technical	10	8	36	30	31	
Group 5: Socio-economic	1	2	3	3	3	
Group 6: Regulatory	1	1	4	2	3	
Group 7: Financial Overall technology weighted total	10	3	37 123	27 99	33 109	
			123	33	103	
ENVIRONMENTAL WEIGHT	10	7	07	~		
Group 1: Human health and safety Group 2: Environmental impact	10 10	7 8	37	31 29	33 29	
Group 2: Environmental Impact Group 3: Environmental objectives	10	7	30 30	29 26	29	
Group 4: Technical	1	8	4	3	3	
Group 5: Socio-economic	1	2	3	3	3	
Group 6: Regulatory	1	1	4	2	3	
Group 7: Financial	1	3	4	3	3	
Overall environmental weighted total			111	97	98	
FINANCIAL WEIGHT				· · ·	3	
Group 1: Human health and safety	1	7	4	3		
Group 1: Human health and safety Group 2: Environmental impact	1	8	3	3	3	
Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives	1 1	8 7	3 3	3 3	3 2	
Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical	1 1 1	8 7 8	3 3 4	3 3 3	3 2 3	
Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic	1 1 1 1	8 7 8 2	3 3 4 3	3 3 3 3	3 2 3 3	
Group 1: Human health and safety Group 2: Environmental impact	1 1 1	8 7 8	3 3 4	3 3 3	3 2 3	

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Attributes	Sub-attinutes	~	<u> </u>	/ •	~ ~	Scolling Notes
						It was noted that this waste stream corresponds primarily to reactor
						components and the magnox and graphite components could be segregated -
						with metals being treated as part of the metal waste stream. Independent
						disposal routes exist for graphite and magnox. Physically both are stored
						together in the beta/gamma waste store. Treatment options likely to be similar
						therefore considered together for the purposes of this study.
Group 1: Human health a	and safety	T				
1. Public H&S individuals	1.1 Routine radiation doses	+	3	3	3	
1. Tublic Tido Individuais	1.2 Rad accident risks	+	4	3	3	
		+				
	1.3 Non-rad hazards and risks	$\perp$	4	3	3	
<ol><li>Public H&amp;S collective</li></ol>	2.1 Routine radiation doses		4	3	3	
3. Worker H&S individuals	3.1 Routine radiation doses		3	3	3	
						Risks associated with conditioning wastes for disposal - transferral of material
	3.2 Rad accident risks		3	4	4	offsite (to Sellafield or another site therefore equivalent).
	3.3 Non-rad hazards and risks	1	3	3	4	
	Totals	<u>, † – </u>	24	22	23	
	Totais	+	24	22	23	
		+	ļ			
		⊢	L			
Group 2: Environmental		$\bot$				
4. Physical environment	4.1 Air quality		3	3	3	
	4.2 Water quality	1	3	3	3	
	4.3 Land quality	1	3	3	3	
	4.4 Visual impact	+	3	4	4	
		<u>+</u>				
	4.5 Nuisance	—	3	3	3	
	4.6 Use of natural resources		3	3	3	
	4.7 Transport		4	2	2	
<ol><li>Flora and fauna</li></ol>	5.1 Preservation of ecosystems		3	4	4	
	Totals		25	25	25	
		8				
		- 0	, ,			
0 0 F 1		+				
Group 3: Environmental		$\perp$		_		
<ol><li>Environmental objective</li></ol>		_	3	3	3	
	6.2 Waste hierarchy		1	1	1	
	6.3 Hazard reduction		4	3	2	
	6.4 Concentrate and contain		3	3	3	
	6.5 Generation of secondary wastes	1	3	2	3	
	6.6 Greenhouse gas emmissions	-	4	2	2	
		+				
	6.7 Proximity principle	—	4	2	2	
	Totals	;	22	16	16	
		7	7			
Group 4: Technical						
7. Viability	7.1 Maturity of technology	1	3	3	5	
	7.2 Continued availability of option	+	3	3	4	
				3		
				•		
	7.3 Throughput/capacity of option	-	3	3	4	
8. Nuclear Safety	7.3 Throughput/capacity of option 8.1 Likelihood of meeting CFA	$\vdash$	3 3	3	4	
8. Nuclear Safety 10. Programme	7.3 Throughput/capacity of option 8.1 Likelihood of meeting CFA 10.1 Scheduling variance compared to LTP	E	3 3 3	3 3	4 4 3	
	7.3 Throughput/capacity of option 8.1 Likelihood of meeting CFA	F	3 3	3	4	
	7.3 Throughput/capacity of option 8.1 Likelihood of meeting CFA 10.1 Scheduling variance compared to LTP		3 3 3	3 3	4 4 3	Transfer to another site results in conditioned wastes being returned to site -
	7.3 Throughput/capacity of option 8.1 Likelihood of meeting CFA 10.1 Scheduling variance compared to LTP 10.2 Minimising project risk to NDA		3 3 3 3	3 3 2	4 4 3 3	Transfer to another site results in conditioned wastes being returned to site - conditioning and interim storage and transfer are therefore equivalent.
	7.3 Throughput/capacity of option     8.1 Likelihood of meeting CFA     10.1 Scheduling variance compared to LTP     10.2 Minimising project risk to NDA     10.3 Discharge of NDA liabilities		3 3 3 3 3	3 3 2 3	4 4 3 3 4	Transfer to another site results in conditioned wastes being returned to site - conditioning and interim storage and transfer are therefore equivalent.
	7.3 Throughput/capacity of option     8.1 Likelihood of meeting CFA     10.1 Scheduling variance compared to LTP     10.2 Minimising project risk to NDA     10.3 Discharge of NDA liabilities     10.4 Consistency with site End State		3 3 3 3 3 4	3 3 2 3 4	4 4 3 3 4 4	
	7.3 Throughput/capacity of option     8.1 Likelihood of meeting CFA     10.1 Scheduling variance compared to LTP     10.2 Minimising project risk to NDA     10.3 Discharge of NDA liabilities		3 3 3 3 3 4 25	3 3 2 3	4 4 3 3 4	
	7.3 Throughput/capacity of option     8.1 Likelihood of meeting CFA     10.1 Scheduling variance compared to LTP     10.2 Minimising project risk to NDA     10.3 Discharge of NDA liabilities     10.4 Consistency with site End State	<b>8</b>	3 3 3 3 3 4 25	3 3 2 3 4	4 4 3 3 4 4	
10. Programme	7.3 Throughput/capacity of option     8.1 Likelihood of meeting CFA     10.1 Scheduling variance compared to LTP     10.2 Minimising project risk to NDA     10.3 Discharge of NDA liabilities     10.4 Consistency with site End State     Totals		3 3 3 3 3 4 25	3 3 2 3 4	4 4 3 3 4 4	
10. Programme Group 5: Socio-economi	7.3 Throughput/capacity of option 8.1 Likelihood of meeting CFA 10.1 Scheduling variance compared to LTP 10.2 Minimising project risk to NDA 10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals		3 3 3 3 4 25 3	3 3 2 3 4	4 3 3 4 4 31	
10. Programme	7.3 Throughput/capacity of option     8.1 Likelihood of meeting CFA     10.1 Scheduling variance compared to LTP     10.2 Minimising project risk to NDA     10.3 Discharge of NDA liabilities     10.4 Consistency with site End State     Totals		3 3 3 3 3 4 25	3 3 2 3 4	4 4 3 3 4 4	
10. Programme Group 5: Socio-economi	7.3 Throughput/capacity of option 8.1 Likelihood of meeting CFA 10.1 Scheduling variance compared to LTP 10.2 Minimising project risk to NDA 10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals c c 11.1 Economic impacts		3 3 3 3 4 25 3 3 3	3 3 2 3 4 24 3 3	4 3 3 4 4 31 3	
10. Programme Group 5: Socio-economi	7.3 Throughput/capacity of option     8.1 Likelihood of meeting CFA     10.1 Scheduling variance compared to LTP     10.2 Minimising project risk to NDA     10.3 Discharge of NDA liabilities     10.4 Consistency with site End State     Totals     c     11.1 Economic impacts     11.2 Culture and heritage	8	3 3 3 3 3 4 25 3 3 3 3	3 3 2 3 4 24 24 3 3 3	4 3 3 4 4 31 3 3 3	
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Group 1: Human health and safety       10       7       34       31       33         Group 2: Environmental impact       10       8       31       31       31         Group 3: Environmental objectives       10       7       31       23       23         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       1       3       3       2       3         Overall environmental weighted total       110       97       101         FINANCIAL WEIGHT							
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Group 3: Environmental objectives       10       7       31       23       23         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       1       3       3       2       3         Overall environmental weighted total       110       97       101         FINANCIAL WEIGHT       1       7       3       3         Group 1: Human health and safety       1       7       3       3         Group 2: Environmental impact       1       8       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30	Group 1: Human health and safety	10	7	34	31	33	
Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       4         Group 5: Socio-economic       1       2       3       3       4         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       1       3       3       2       3         Overall environmental weighted total       110       97       101         Financial       1       7       3       3       3         Group 7: Financial       1       7       3       3       3         Group 1: Human health and safety       1       7       3       3       3         Group 2: Environmental impact       1       8       3       3       3       3         Group 3: Environmental objectives       1       7       3       2       2       2         Group 4: Technical       1       8       3       3       3       4         Group 5: Socio-economic       1       2       3       3       3       3         Group 6: Regulatory       1       1       4       3       4       <		10		31		31	
Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       1       3       3       2       3         Overall environmental weighted total       110       97       101         Financial       1       7       3       3       3         Group 1: Human health and safety       1       7       3       3       3         Group 2: Environmental impact       1       8       3       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30			-				
Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       1       3       3       2       3         Overall environmental weighted total       110       97       101         Financial       1       7       3       3       2         Group 1: Human health and safety       1       7       3       3       3         Group 2: Environmental impact       1       8       3       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30							
Group 7: Financial       1       3       3       2       3         Overall environmental weighted total       110       97       101         Financial       110       97       101         Financial       1       7       3       3         Group 1: Human health and safety       1       7       3       3       3         Group 2: Environmental impact       1       8       3       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30							
Overall environmental weighted total         110         97         101           Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image: Image							
FINANCIAL WEIGHT       Image: Constraint of the system         Group 1: Human health and safety       1       7       3       3         Group 2: Environmental impact       1       8       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30		1	3			-	
Group 1: Human health and safety       1       7       3       3       3         Group 2: Environmental impact       1       8       3       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30	Overall environmental weighted total			110	97	101	
Group 1: Human health and safety       1       7       3       3       3         Group 2: Environmental impact       1       8       3       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30						<u> </u>	
Group 1: Human health and safety       1       7       3       3       3         Group 2: Environmental impact       1       8       3       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30	FINANCIAL WEIGHT					1	1
Group 2: Environmental impact       1       8       3       3         Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30		1	7	3	3	3	
Group 3: Environmental objectives       1       7       3       2       2         Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30							1
Group 4: Technical       1       8       3       3       4         Group 5: Socio-economic       1       2       3       3       3         Group 6: Regulatory       1       1       4       3       4         Group 7: Financial       10       3       30       21       30							1
Group 5: Socio-economic         1         2         3         3         3           Group 6: Regulatory         1         1         4         3         4           Group 7: Financial         10         3         30         21         30	Group 4: Technical	1	8				1
Group 6: Regulatory         1         1         4         3         4           Group 7: Financial         10         3         30         21         30		1	2	3		3	
	Group 6: Regulatory		1	4	3	4	
Overall financial weighted total 50 39 50		10	3				
	Overall financial weighted total			50	39	50	l

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Attributes	Sub-attributes	è	/ ~	/ ో	/ 8	5 / 3 <sup>5</sup>	Scoring Notes
Allibules	ous attributes	-	( ľ	( Ť	í ľ	í ľ	
Group 1: Human health and	l safety						
							Discussed Decontamination only - low doses from H-3 releases expected;
1. Public H&S individuals	1.1 Routine radiation doses		4	3	3	3	present critical group doses of order of 10 µSv/y - scored 4 in view of uncertainties.
1. FUDIIC FIAS INUIVIUUAIS	1.2 Rad accident risks		4	3	3	3	Decontamination - low consequence - similar argument to 1.1.
				Ŭ		, , , , , , , , , , , , , , , , , , ,	All options discussed - processes would be engineered to high standards;
	1.3 Non-rad hazards and risks		3	3	3	3	scoring reflects additional risk from off-site transport.
2. Public H&S collective	2.1 Routine radiation doses		3	3	3	3	
<ol><li>Worker H&amp;S individuals</li></ol>	3.1 Routine radiation doses 3.2 Rad accident risks		4	4	4	4	
	3.3 Non-rad hazards and risks		4	4	3	3	
	Totals	Ĺ	25	23	22	22	<u> </u>
		7					
		Ľ				ļ	
Group 2: Environmental im	раст	┝				<del> </del>	Little discernible impact -operations would be custom build and within
4. Physical environment	4.1 Air quality		4	4	4	4	Little discernible impact -operations would be custom build and within buildings.
	4.2 Water quality	F	4	4	4	4	No discernible impact permitted; but cannot guarantee zero.
	4.3 Land quality		3	3	3	3	
	4.4 Visual impact	Ĺ	3	3	3	3	
	4.5 Nuisance 4.6 Use of natural resources	┝	2	3	3	3	
	4.6 Use of hatural resources 4.7 Transport	┢	4	4	2	2	
5. Flora and fauna	5.1 Preservation of ecosystems		3	4	3	3	
	Totals		26	27	24	25	
		8					
Group 3: Environmental ob	leathras						
Group 3: Environmental ob		-					Potential for volume reduction with decontamination; conditioned disposal
6. Environmental objectives	6.1 Waste volume		4	3	3	3	waste volumes greater - all assumed equivalent.
	6.2 Waste hierarchy		1	1	1	1	
	6.3 Hazard reduction		4	3	2	2	
	6.4 Concentrate and contain		4	4	3	4	
	6.5 Generation of secondary wastes 6.6 Greenhouse gas emmissions	-	4	4	2	4	
	6.7 Proximity principle		4	4	3	3	
	Totals		23	22	17	20	
		7					
Crown & Technical							
Group 4: Technical 7. Viability	7.1 Maturity of technology	┢	3	4	3	4	
	7.2 Continued availability of option	Ĺ	3	4	2	4	<u>                                      </u>
							Condition and interim store = LTP option (5); decontamination and disposal
		1				1	at Sellafield have potential to impact on LTP, but less than tranfer to
	7.3 Throughput/capacity of option	1	3	5	2	3	another site where there is complete dependence on third party and no existing arrangements.
8. Nuclear Safety	8.1 Likelihood of meeting CFA	┢	2	3	2	3	same ganangomonio.
10. Programme	10.1 Scheduling variance compared to LTP	Ĺ	3	4	3	3	<u>                                      </u>
	10.2 Minimising project risk to NDA		3	4	2	3	
	10.2 Discharge of NDA liek <sup>1141</sup>	1		_	_	_	Decontamination reduces liabilities to a greater extent than removal of
	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State	┝	4	2	3	3	material off-site; condition and interim store - liabilities remain on-site.
	Totals	$\vdash$	24	30	20	26	
		8					
		1					
Group 5: Socio-economic	11.1 Feenemie imperte	<u> </u>	_	~	_	_	
11. Local community	11.1 Economic impacts 11.2 Culture and heritage	┝	3	3	3	3	<u> </u>
	Totals	$\vdash$	6	6	6	6	
		2					
Group 6: Regulatory issues							
							Arrangements exist for disposal at Sellafield for some metals; condition and
							store precedents exist at other sites; doubts over feasibility of
12. Acceptability	12.1 Likelihood of gaining regulatory acceptance		3	4	3	4	decontamination affects scoring and transfer to another site not established.
	Totals	L	3	4	3	4	
		1					
Group 7: Financial		┝					
13. Financial cost	13.1 Total undiscounted cost	┢	3	3	2	3	
	13.2 Rate of spend compared to LTP	F	2	3	3	3	
	13.3 Stability of cost estimates		3	4	3	3	
	Totals	Ļ	8	10	8	9	
		3				<u> </u>	4
	Total less Group 7 scores	┢	107	112	92	103	1
							1
	Overall Total		115	122	100	112	4
	No. of 5s	┝	0	1	0	0	4
	No. of 0s		0	0	0	0	1
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UNWEIGHTED							
Group 1: Human health and safety	1	7	25	23	22	22	
Group 2: Environmental impact	1	8	26	27	24	25	
Group 3: Environmental objectives	1	7	23	22	17	20	
Group 4: Technical	1	8	24	30	20	26	
Group 5: Socio-economic	1	2	6	6	6	6	
Group 6: Regulatory	1	1	3	4	3	4	
Group 7: Financial	1	3	8 115	10 122	8 100	9 112	
Overall unweighted total			115	122	100	112	
						$\vdash$	
TEAM WEIGHT					-		
Group 1: Human health and safety	10	7	36	33	31	31	
Group 2: Environmental impact	10	8	33	34	30	31	
Group 3: Environmental objectives	5	7	16	16	12	14	
Group 4: Technical	8	8	24	30	20	26	
Group 5: Socio-economic	1	2	3	3	3	3	
Group 6: Regulatory	5	1	15	20	15	20	
Group 7: Financial	8	3	21	27	21	24	
Overall team weighted total			148	162	133	150	
TECHNOLOGY WEIGHT							
Group 1: Human health and safety	10	7	36	33	31	31	
Group 2: Environmental impact	1	8	3	3	3	3	
Group 3: Environmental objectives	1	7	3	3	2	3	
Group 4: Technical	10	8	30	38	25	33	
Group 5: Socio-economic	1	2	3	3	3	3	
Group 6: Regulatory	1	1	3	4	3	4	
Group 7: Financial	10	3	27	33	27	30	
Overall technology weighted total			105	117	95	107	
ENVIRONMENTAL WEIGHT	10	-	00	00	04	01	
Group 1: Human health and safety Group 2: Environmental impact	10	7 8	36 33	33 34	31 30	31 31	
Group 2: Environmental Impact Group 3: Environmental objectives	10 10	8	33	34	24	29	
Group 3: Environmental objectives	1	8	3	4	3	3	
Group 4: Technical Group 5: Socio-economic	1	2	3	3	3	3	
Group 6: Regulatory	1	1	3	4	3	4	
Group 7: Financial	1	3	3	3	3	3	
Overall environmental weighted total			113	112	97	105	
FINANCIAL WEIGHT							
Group 1: Human health and safety	1	7	4	3	3	3	
Group 2: Environmental impact	1	8	3	3	3	3	
Group 3: Environmental objectives Group 4: Technical	1	7	3	3	2	3 3	
Group 4: Technical Group 5: Socio-economic	1	8	3	4	3	3	
Group 5: Socio-economic Group 6: Regulatory	1	2	3	4	3	4	
Group 7: Financial	10	3	27	33	27	30	
Overall financial weighted total		Ť	46	54	44	49	
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Group 1: Human health and	l safety					
1. Public H&S individuals	1.1 Routine radiation doses		4	3	3	
	1.2 Rad accident risks		4	2	2	
	1.3 Non-rad hazards and risks		4	3	3	
2. Public H&S collective	2.1 Routine radiation doses		4	3	2	
						Small, high activity waste stream; doses limited by remote
						handling methods - likelihood of dose rates from
<ol><li>Worker H&amp;S individuals</li></ol>	3.1 Routine radiation doses		3	3	3	packaged wastes.
			_			Small, high activity waste stream; risks limited by remote
	3.2 Rad accident risks		3	3	3	handling methods.
	0.0 New year because and vieles		_			Low volume waste stream; risks limited by remote
	3.3 Non-rad hazards and risks Totals	+	3 25	3 20	3 19	handling methods.
	l	7		20	19	
		+				
Group 2: Environmental im	pact	+	1			
4. Physical environment	4.1 Air quality	+	4	3	3	
	4.2 Water quality	1	4	3	3	No discrimination between different options.
	4.3 Land quality	1	3	3	3	No discrimination between different options.
	4.4 Visual impact	1	3	4	3	
	4.5 Nuisance	1	4	3	3	
	4.6 Use of natural resources		3	2	3	
	4.7 Transport		4	2	2	
5. Flora and fauna	5.1 Preservation of ecosystems		3	3	3	
	Totals	_	28	23	23	
		8				
Group 3: Environmental ob		_	_	_	•	
6. Environmental objectives			3	3	3	
	6.2 Waste hierarchy	_		1	- 1	Conditioning and interim storage and tranfer to another
						site involve conditioning waste to passive form; Level of
	6.3 Hazard reduction		3	3	2	conditioning for disposal at Sellafield unknown.
	6.4 Concentrate and contain		4	4	3	
	6.5 Generation of secondary wastes		3	3	3	
	6.6 Greenhouse gas emmissions		3	3	2	
	6.7 Proximity principle		5	3	3	
	Totals	;	22	20	17	
		7				
Group 4: Technical						
7. Viability	7.1 Maturity of technology		2	2	2	No discrimination.
	7.2 Continued availability of option		3	3	2	
	7.3 Throughput/capacity of option		3	3	2	
						Sellafield does not accept liquid wastes; activity level may
						affect transfer to another site; encapsulation presently
8. Nuclear Safety	8.1 Likelihood of meeting CFA		3	2	0	under consideration by NIREX.
10. Programme	10.1 Scheduling variance compared to LTP	_	3	3	3	Dista secondated with two of an electric data de
		1	1			Risks associated with transfer elsewhere due to
	10.2 Minimising project risk to NDA	1	4	3	2	dependance on third party - relatively greater for Sellafield due to known concerns about liquid waste.
	TO.2 MILITING Project TISK to NDA	-	4	3	2	Disposal at Sellafield implies complete removal of liability;
						transfer to another site involves return of the condioned
						waste to the site and so is equivalent to the conditioning
	10.3 Discharge of NDA liabilities		3	3	4	and interim store option
	10.4 Consistency with site End State		4	3	3	
	Totals	;	25	22	18	
		8				
Group 5: Socio-economic					L	
11. Local community	11.1 Economic impacts		3	3	3	
	11.2 Culture and heritage	+	3	3	3	
	Totals	_	6	6	6	
One of Description		2				
Group 6: Regulatory issues		+	4	-	· ·	
12 Accontability	10.1 Likelihood of coining regulatory	+	4	3	3	
12. Acceptability	12.1 Likelihood of gaining regulatory acceptance		4	3	3	
12. Acceptability	12.1 Likelihood of gaining regulatory acceptance Totals					
12. Acceptability		1				
12. Acceptability Group 7: Financial 13. Financial cost			3	2	3	
Group 7: Financial	Totals 13.1 Total undiscounted cost					
Group 7: Financial	Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP		3	3	3	
Group 7: Financial	Totals 13.1 Total undiscounted cost	1	3			
Group 7: Financial	Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates	1	3 3 3 9	3 2	3 2	
Group 7: Financial	Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates	1	3 3 3 9	3 2 7	3 2	
Group 7: Financial	Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates	1	3 3 3 9	3 2	3 2	
Group 7: Financial	Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals Total less Group 7 scores	1	3 3 3 9 110	3 2 7 94	3 2 8 8 86	
Group 7: Financial	Totals         13.1 Total undiscounted cost         13.2 Rate of spend compared to LTP         13.3 Stability of cost estimates         Totals	1	3 3 3 9	3 2 7	3 2 8	
Group 7: Financial	Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals Total less Group 7 scores Overall Tota	1	3 3 9 110 119	3 2 7 94 101	3 2 8 8 86 94	
Group 7: Financial	Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals Total less Group 7 scores	1	3 3 3 9 110	3 2 7 94	3 2 8 8 86	

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UNWEIGHTED	/ <u> </u>	<u> </u>		/ ```	┌╰́ſ	/
Group 1: Human health and safety	1	7	25	20	19	
Group 2: Environmental impact	1	8	28	23	23	
Group 3: Environmental objectives	1	7	22	20	17	
Group 4: Technical	1	8	25	22	18	
Group 5: Socio-economic Group 6: Regulatory	1	2	6 4	6 3	6 3	
Group 7: Financial	1	3	9	7	8	
Overall unweighted total			119	101	94	
TEAM WEIGHT					+	
Group 1: Human health and safety	10	7	36	29	27	
Group 2: Environmental impact	10	8	35	29	29	
Group 3: Environmental objectives Group 4: Technical	5 8	7	16 25	14 22	12 18	
Group 5: Socio-economic	0 1	0 2	25	3	3	
Group 6: Regulatory	5	1	20	15	15	
Group 7: Financial	8	3	24	19	21	
Overall team weighted total			158	130	125	
TECHNOLOGY WEIGHT						
Group 1: Human health and safety	10	7	36	29	27	
Group 2: Environmental impact Group 3: Environmental objectives	1	8	4	3	3	
Group 4: Technical	1 10	8	31	3 28	23	
Group 5: Socio-economic	1	2	3	3	3	
Group 6: Regulatory	1	1	4	3	3	
Group 7: Financial	10	3	30	23	27	
Overall technology weighted total			111	91	88	
ENVIRONMENTAL WEIGHT		_				
Group 1: Human health and safety	10 10	7	36	29	27	
Group 2: Environmental impact Group 3: Environmental objectives	10	8	35 31	29 29	29 24	
Group 4: Technical	1	8	3	3	2	
Group 5: Socio-economic	1	2	3	3	3	
Group 6: Regulatory	1	1	4	3	3	
Group 7: Financial Overall environmental weighted total	1	3	3 115	2 97	3	
			115	31	91	
FINANCIAL WEIGHT Group 1: Human health and safety	1	7	4	3	3	
Group 2: Environmental impact	1	8	4	3	3	
Group 3: Environmental objectives	1	7	3	3	2	
Group 4: Technical	1	8	3	3	2	
Group 5: Socio-economic	1	2	3	3	3	
Group 6: Regulatory Group 7: Financial	1 10	1 3	4 30	3 23	3 27	
Overall financial weighted total	10		<b>50</b>	41	43	

Attributes	Sub-attributes	No. sub-attributes		Pro- Ta- non-	of and a second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second
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Group 1: Human health and					
1. Public H&S individuals	1.1 Routine radiation doses		4	3	
	1.2 Rad accident risks		4	3	
	1.3 Non-rad hazards and risks	_	4	3	
2. Public H&S collective 3. Worker H&S individuals	2.1 Routine radiation doses 3.1 Routine radiation doses		4	3	
	3.2 Rad accident risks		3	3	
	3.3 Non-rad hazards and risks		4	3	
	Totals		26	21	
		7			
Group 2: Environmental im					
<ol> <li>Physical environment</li> </ol>	4.1 Air quality	_	3	4	
	4.2 Water quality 4.3 Land quality	-	3	4	
	4.4 Visual impact		3	4	
	4.5 Nuisance	-	3	4	
	4.6 Use of natural resources		3	3	
	4.7 Transport		4	2	
5. Flora and fauna	5.1 Preservation of ecosystems		4	3	
	Totals		26	26	
		8			
Oneren de Engline mandel et	leading a	_			
Group 3: Environmental ob 6. Environmental objectives		_	3	3	
6. Environmental objectives	6.2 Waste hierarchy	-	3	2	
	6.3 Hazard reduction		4	3	
	6.4 Concentrate and contain		3	3	
	6.5 Generation of secondary wastes		3	2	
	6.6 Greenhouse gas emmissions		3	3	
	6.7 Proximity principle		3	3	
	Totals		22	19	
		7			
Group 4: Technical		_			
7. Viability	7.1 Maturity of technology	-	4	3	
	7.2 Continued availability of option		4	3	
	7.3 Throughput/capacity of option		4	3	
8. Nuclear Safety	8.1 Likelihood of meeting CFA		3	3	
10. Programme	10.1 Scheduling variance compared to LTP		3	3	
Ť	10.2 Minimising project risk to NDA		4	3	
					Transfer to another site results in conditioned wastes being
	10.3 Discharge of NDA liabilities		2	2	returned to site - the two options are therefore equivalent.
	10.4 Consistency with site End State		4 28	3	
	Totals	8		23	
		0			
Group 5: Socio-economic					
11. Local community	11.1 Economic impacts		3	3	
	11.2 Culture and heritage		3	3	
	Totals		6	6	
		2			
One on Description 1					
Group 6: Regulatory issue			A	•	
Group 6: Regulatory issue 12. Acceptability	12.1 Likelihood of gaining regulatory acceptance		4	3	
		-	4	3 <i>3</i>	
	12.1 Likelihood of gaining regulatory acceptance	1	4		
	12.1 Likelihood of gaining regulatory acceptance	-	4		
12. Acceptability	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost	-	4	3	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP	-	4 3 4	3 3 3	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates	1	4 3 4 4	3 3 3 3	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP	1	4 3 4 4 11	3 3 3	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates	1	4 3 4 4 11	3 3 3 3	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals	3	4 3 4 4 11	3 3 3 9	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates	3	4 3 4 4 11	3 3 3 3	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals	3	4 3 4 4 11	3 3 3 9	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals Total less Group 7 scores Overall Total	3	4 3 4 11 112 123	3 3 3 9 98 107	
12. Acceptability Group 7: Financial	12.1 Likelihood of gaining regulatory acceptance Totals 13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP 13.3 Stability of cost estimates Totals Total less Group 7 scores	3	4 3 4 11 112	3 3 3 9 98	

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Group 1: Human health and safety	1	7	26	21	
Group 2: Environmental impact	1	8	26	26	
Group 3: Environmental objectives	1	7	22	19	
Group 4: Technical	1	8	28	23	
Group 5: Socio-economic	1	2	6	6	-
Group 6: Regulatory	1	1	4	3	-
Group 7: Financial	1	3	11 123	9 107	-
Overall unweighted total			123	107	-
TEAM WEIGHT					
Group 1: Human health and safety	10	7	37	30	-
Group 2: Environmental impact	10	8	33	33	-
Group 3: Environmental objectives	5	7	16	14	•
Group 4: Technical	8	8	28	23	
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	5	1	20	15	-
Group 7: Financial	8	3	29	24	-
Overall team weighted total			166	141	-
					-
TECHNOLOGY WEIGHT					
Group 1: Human health and safety	10	7	37	30	-
Group 2: Environmental impact	<u>1</u> 1	8	3	3	-
Group 3: Environmental objectives Group 4: Technical	10	8	35	3 29	-
Group 5: Socio-economic	1	2	3	3	-
Group 6: Regulatory	1	1	4	3	-
Group 7: Financial	10	3	37	30	
Overall technology weighted total			122	101	
ENVIRONMENTAL WEIGHT		_			1
Group 1: Human health and safety	10	7	37	30	-
Group 2: Environmental impact Group 3: Environmental objectives	10 10	8	33	33 27	-
Group 4: Technical	10	8	31 4	3	-
Group 5: Socio-economic	1	2	3	3	-
Group 6: Regulatory	1	1	4	3	-
Group 7: Financial	1	3	4	3	
Overall environmental weighted total			115	102	
					1
FINANCIAL WEIGHT					
Group 1: Human health and safety	1	7	4	3	4
Group 2: Environmental impact	1	8	3	3	4
Group 3: Environmental objectives	1	7	3	3	4
Group 4: Technical	1	8	4	3	4
Group 5: Socio-economic	<u>1</u> 1	2	3	3 3	4
Group 6: Regulatory Group 7: Financial	10	3	37	30	4
Overall financial weighted total		0	57 57	48	1
			51	-0	1

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Attributes	Sub-attributes	No. sub-	Con	de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantination de la constantinatis constantination de la constantination de la c	Scoring Notes
Group 1: Human health and	l J safety				
1 Dublic LISC individuals	1.1 Routine radiation doses		4	2	Disposal of waste at Sellafield slightly lower dose than alternative - scored for differentiation.
1. Public H&S individuals	1.2 Rad accident risks	┢	3	3	Risks arise during waste processing - similar for both options.
	1.3 Non-rad hazards and risks		3	3	Risks from off-site movement of materials; both involve bulk movement of grouting materials.
2. Public H&S collective 3. Worker H&S individuals	2.1 Routine radiation doses 3.1 Routine radiation doses	-	4	4	
3. WORKER HAS INDIVIDUAIS	3.2 Rad accident risks		2	4	
	3.3 Non-rad hazards and risks	ľ	3	4	
	Totals	7	22	24	
Group 2: Environmental im	pact	-			
4. Physical environment	4.1 Air quality		3	4	
	4.2 Water quality	F	3	4	
	4.3 Land quality 4.4 Visual impact	┢	3	4	
	4.4 Visual impact 4.5 Nuisance	$\vdash$	3	4	
	4.6 Use of natural resources		3	3	
	4.7 Transport	L	4	2	
5. Flora and fauna	5.1 Preservation of ecosystems Totals	-	3 24	3 27	
	Totais	8		21	
Group 3: Environmental ob					
6. Environmental objectives	6.1 Waste volume 6.2 Waste hierarchy	┢	4	3	
	6.3 Hazard reduction	ŀ	4	3	
	6.4 Concentrate and contain		4	3	
	6.5 Generation of secondary wastes	-	3	4	
	6.6 Greenhouse gas emmissions 6.7 Proximity principle		3	4	
	Totals	7	23	20	
Group 4: Technical 7. Viability	7.1 Maturity of technology		3	4	
7. Vidomty	7.2 Continued availability of option	1	4	2	
	7.3 Throughput/capacity of option		3	3	
8. Nuclear Safety	8.1 Likelihood of meeting CFA	-	4	2	
10. Programme	10.1 Scheduling variance compared to LTP 10.2 Minimising project risk to NDA		4	3	
	10.3 Discharge of NDA liabilities	ŀ	3	4	
	10.4 Consistency with site End State		4	4	
	Totals	8	<b>29</b>	25	
Group 5: Socio-economic		-			
11. Local community	11.1 Economic impacts	l	4	3	
	11.2 Culture and heritage Totals	_	3 7	3 6	
Group 6: Pogulatory issued		2	2		
Group 6: Regulatory issues 12. Acceptability	12.1 Likelihood of gaining regulatory acceptance	┢	4	3	
	Totals	1	4	3	
One To Figure 1		Ĺ	1		
Group 7: Financial 13. Financial cost	13.1 Total undiscounted cost	╞	3	4	
	13.2 Rate of spend compared to LTP	t	3	3	
	13.3 Stability of cost estimates		3	2	
	Totals	3	<b>9</b>	9	
	Total less Group 7 scores		109	105	
	Overall Total		118	114	
	No. of 5s	┢	0	0	
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Group 1: Human health and safety	1	7	22	24	
Group 2: Environmental impact	1	8	24	27	
Group 3: Environmental objectives	1	7	23	20	
Group 4: Technical	1	8	29	25	
Group 5: Socio-economic	1	2	7	6	
Group 6: Regulatory	1	1	4	3	
Group 7: Financial	1	3	9	9	
Overall unweighted total		0	118	114	
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					1
TEAM WEIGHT					
Group 1: Human health and safety	10	7	31	34	
Group 2: Environmental impact	10	8	30	34	
Group 3: Environmental objectives	5	7	16	14	
Group 4: Technical	8	8	29	25	
Group 5: Socio-economic	1	2	4	3	
Group 6: Regulatory	5	1	20	15	
Group 7: Financial	8	3	24	24	
Overall team weighted total			155	149	
TECHNOLOGY WEIGHT					
Group 1: Human health and safety	10	7	31	34	
Group 2: Environmental impact	1	8	3	3	
Group 3: Environmental objectives	1	7	3	3	
Group 4: Technical	10	8	37	31	
Group 5: Socio-economic	1	2	4	3	
Group 6: Regulatory	1	1	4	3	
Group 7: Financial	10	3	30	30	
Overall technology weighted total			112	108	
ENVIRONMENTAL WEIGHT					
Group 1: Human health and safety	10	7	31	34	1
Group 2: Environmental impact	10	8	30	34	1
Group 3: Environmental objectives	10	7	33	29	1
Group 4: Technical	1	8	4	3	1
Group 5: Socio-economic	1	2	4	3	1
Group 6: Regulatory	1	1	4	3	1
Group 7: Financial	1	3	3	3	1
Overall environmental weighted total			108	109	
					1
FINANCIAL WEIGHT		_		_	
Group 1: Human health and safety	1	7	3	3	1
Group 2: Environmental impact	1	8	3	3	
Group 3: Environmental objectives	1	7	3	3	
Group 4: Technical	1	8	4	3	
Group 5: Socio-economic	1	2	4	3	
Group 6: Regulatory	1	1	4	3	
	1 10	1 3	4 30 <b>51</b>	3 30 <b>49</b>	

### APPENDIX E. SCORES FOR LLW

LLW Aggregate final.xls

		. sub-attributes	Jon Star	Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colored Colore	Constant of the second	0000 0000 0000000000000000000000000000	Contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction o	Scoring Notes
Attributes	Sub-attributes	Ň.	/ °	/ &	/ & ð	18	1 03	Scoring Notes
Group 1: Human health and	l safety	-						incl. consideration of soil wastes (only 4 out of 5 options - no decontamination?
								vLLW score changed to be consistent with that for on-site disposal (both assumed to
1. Public H&S individuals	1.1 Routine radiation doses 1.2 Rad accident risks		4	4	5 4	4	5 4	relatively unengineered but more than landscaping.
	1.3 Non-rad hazards and risks		4	4	4	4	4	Transport risks dominate - distance to vLLW and LLW facilities assumed similar.
2. Public H&S collective	2.1 Routine radiation doses		4	4	4	4	4	Potential for collective dose > 1 manSv if worldwide population considered.
<ol><li>Worker H&amp;S individuals</li></ol>	3.1 Routine radiation doses		4	4	4	4	4	All likely to be less than 2 mSv/y.
	3.2 Rad accident risks		4	4	4	4	4	Batch processes - limited potential for significant consequences from loss of control. ISO container characteristics limit risks from disposal at LLWR; other processes
	3.3 Non-rad hazards and risks Totals		3 27	3 27	3 28	3 26	4 28	involve less rigorous containment; decontamination significantly risky operation.
		/						
Group 2: Environmental im	pact							
<ol> <li>Physical environment</li> </ol>	4.1 Air quality		4	4	4	4	4	No obvious polluting processes involved.
	4.2 Water quality		4	3	4	3	3	Decontamination dry process; landscaping carry potential for leachate and scores reduced accordingly.
	4.3 Land quality 4.4 Visual impact	$\vdash$	2	2	4	3	3	
	4.5 Nuisance	L	1	3	4	2	3	
	4.6 Use of natural resources		3	5	3	3	3	On-site disposal requires significant use of concrete and capping materials.
5. Flora and fauna	4.7 Transport 5.1 Preservation of ecosystems		3	5 3	4	1	1 3	
J. I Ibra and Iduna	Totals		23	28	30	24	24	
		8						
Group 3: Environmental ob	lactives							
Group 5. Environmental ob	jectives							
								Decontamination has potential to reduce waste volume; on-site landscaping does not
<ol><li>Environmental objectives</li></ol>	6.1 Waste volume		4	4	3	2	2	affect the volume of waste for disposal; other options result in increased volume.
	6.2 Waste hierarchy		4	4	1	1	1	Decontamination and landscape counted as forms of recycling. Decontamination has potential to reduce the hazard; on-site disposal renders hazard
	6.3 Hazard reduction		4	3	3	3	3	passive while landscaping has no effect on hazard.
	6.4 Concentrate and contain		3	2	5	4	4	
	6.5 Generation of secondary wastes 6.6 Greenhouse gas emmissions		2	5 4	4	3	3	Relative consolidated scoring reviewed and concluded to be OK.
	6.7 Proximity principle		3	4	5	1	1	
	Totals	_	22	26	24	15	15	
		/						
Group 4: Technical								
7. Viability	7.1 Maturity of technology	-	4	4	3	3	4	Techniques for decontamination are established but not at Chapelcross;
	7.2 Continued availability of option		4	3	5	5	3	On-site & VLLW facility do not exist but assumed would have appropriate capacity.
	7.3 Throughput/capacity of option		1	3	4	3	2	
8. Nuclear Safety 10. Programme	8.1 Likelihood of meeting CFA 10.1 Scheduling variance compared to LTP		2	3	4	3	3	
TU. Flogramme	10.2 Minimising project risk to NDA		2	3	3	3	2	LLWR is likely to cease acceptance of Aggregate
	10.3 Discharge of NDA liabilities		4	2	2	4	4	Uncertainties related to on-site landscaping and disposal - least discharge of NDA liabilities.
				<u> </u>	~			On-site landscaping inconsistent with greenfield site endstate; on-site disposal
	10.4 Consistency with site End State Totals	$\vdash$	4 24	0 21	2 26	4 28	4 25	preferrable but still low-scoring.
		8						
Group 5: Socio-economic 11. Local community	11.1 Economic impacts	$\vdash$	3	3	3	3	3	
	11.2 Culture and heritage		3	3	3	3	3	
	Totals		6	6	6	6	6	
Group 6: Regulatory issues		2						
Group of negulatory issues	,	$\vdash$				<u> </u>		
12. Acceptability	12.1 Likelihood of gaining regulatory acceptance Totals	1	4 4	1 1	2 2	4 4	4 4	On-site landscaping would require a waste management licence exemption (otherwise accumulation of waste); on-site disposal requires planning permission etc.
Group 7: Financial		$\vdash$						Landscaping would imply change to the end-state therefore necessary to consider
13. Financial cost	13.1 Total undiscounted cost		3	2	3	3	3	that final remediation of landscaping will eventually be necessary.
	13.2 Rate of spend compared to LTP		3	4	3	3	3	Landscaping - delayed rate of spend
	13.3 Stability of cost estimates Totals	$\vdash$	4 10	4	4 10	3	2 8	Reflect the level of third party involvement.
		3	10	10	10	3	0	1
	_		106	109	116	103	102	
	Total less Group 7 scores		106	105				
	Total less Group 7 scores Overall Total		116	119	126	112	110	
	Overall Total		116	119	126	112	110	

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UNWEIGHTED	<u> </u>					~ ~	
Group 1: Human health and safety	1	7	27	27	28	26	28
Group 2: Environmental impact	1	8	23	28	30	24	24
Group 3: Environmental objectives	1	7	22	26	24	15	15
Group 4: Technical	1	8	24	21	26	28	25
Group 5: Socio-economic	1	2	6	6	6	6	6
Group 6: Regulatory	1	1	4	1	2	4	4
Group 7: Financial Overall unweighted total	1	3	10 116	10 119	10 126	9 112	8 110
			110	119	120	112	
TEAM WEIGHT							
Group 1: Human health and safety	10	7	39	39	40	37	40
Group 2: Environmental impact	10	8	29	35	38	30	30
Group 3: Environmental objectives	5	7	16	19	17	11	11
Group 4: Technical	8	8	24	21	26	28	25
Group 5: Socio-economic	1 5	2	3 20	3 5	3 12	3 20	3 20
Group 6: Regulatory Group 7: Financial	о 8	3	20	5 27	26	20	20
Overall team weighted total		0	157	148	161	153	150
TECHNOLOGY WEIGHT	10	7			40	07	10
Group 1: Human health and safety Group 2: Environmental impact	10 1	7	39 3	39 4	40 4	37 3	40
Group 3: Environmental objectives	1	0 7	3	4	4	2	2
Group 4: Technical	10	8	30	26	33	35	31
Group 5: Socio-economic	1	2	3	3	3	3	3
Group 6: Regulatory	1	1	4	1	2	4	4
Group 7: Financial	10	3	33	33	32	30	27
Overall technology weighted total			115	109	117	114	110
ENVIRONMENTAL WEIGHT							
Group 1: Human health and safety	10	7	39	39	40	37	40
	10		53	33	40		40
Group 2: Environmental impact	10	8	29	35	38	30	30
Group 2: Environmental impact Group 3: Environmental objectives							
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical	10 10 1	8 7 8	29 31 3	35 37 3	38 34 3	30 21 4	30 21 3
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic	10 10 1 1	8 7 8 2	29 31 3 3	35 37 3 3	38 34 3 3	30 21 4 3	30 21 3 3
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory	10 10 1 1 1	8 7 8 2 1	29 31 3 3 4	35 37 3 3 1	38 34 3 3 2	30 21 4 3 4	30 21 3 3 4
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial	10 10 1 1 1 1 1	8 7 8 2	29 31 3 4 3	35 37 3 3 1 3	38 34 3 3 2 3	30 21 4 3 4 3	30 21 3 3 4 3
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Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial <b>Overall environmental weighted total</b>	10 10 1 1 1 1	8 7 8 2 1	29 31 3 4 3	35 37 3 3 1 3	38 34 3 3 2 3	30 21 4 3 4 3	30 21 3 3 4 3
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial <b>Overall environmental weighted total</b> <b>FINANCIAL WEIGHT</b>	10 10 1 1 1 1	8 7 8 2 1 3	29 31 3 4 3 112	35 37 3 1 3 121	38 34 3 2 3 124	30 21 4 3 4 3 <b>102</b>	30 21 3 3 4 3 <b>104</b>
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial <b>Overall environmental weighted total</b> <b>FINANCIAL WEIGHT</b> Group 1: Human health and safety	10 10 1 1 1 1 1	8 7 8 2 1 3 3 7	29 31 3 4 3 112 4	35 37 3 1 3 121 4	38 34 3 2 3 124 4	30 21 4 3 4 3 102 4	30 21 3 3 4 3 104 4 4
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial <b>Overall environmental weighted total</b> <b>FINANCIAL WEIGHT</b> Group 1: Human health and safety Group 2: Environmental impact	10 10 1 1 1 1 1 1 1 1	8 7 8 2 1 3 3 7 8	29 31 3 4 3 112 4 4 3	35 37 3 1 3 121 4 4	38 34 3 2 3 124 4 4	30 21 4 3 4 3 102 4 4 3	30 21 3 3 4 3 <b>104</b> 4 3 3
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial <b>Overall environmental weighted total</b> <b>FINANCIAL WEIGHT</b> Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives	10 10 1 1 1 1 1 1 1 1 1 1	8 7 8 2 1 3 3 7 7 8 7	29 31 3 4 3 112 4 4 3 3 3	35 37 3 1 3 121 4 4 4	38 34 3 2 3 3 124 4 4 4 3	30 21 4 3 4 3 102 4 4 3 2	30 21 3 3 4 3 104 4 3 104 4 3 2
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial <b>Overall environmental weighted total</b> <b>FINANCIAL WEIGHT</b> Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical	10 10 1 1 1 1 1 1 1 1 1 1 1	8 7 8 2 1 3 3 7 7 8 7 8	29 31 3 3 4 3 112 4 4 3 3 3 3	35 37 3 1 3 121 4 4 4 4 3	38 34 3 3 2 3 124 4 4 4 3 3	30 21 4 3 4 3 102 4 4 3 2 4	30 21 3 3 4 3 104 
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial <i>Overall environmental weighted total</i> <i>FINANCIAL WEIGHT</i> Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic	10 10 1 1 1 1 1 1 1 1 1 1 1 1 1	8 7 8 2 1 3 3 7 7 8 7 8 2	29 31 3 4 3 112 4 3 3 3 3 3 3 3	35 37 3 1 3 121 4 4 4 4 3 3 3	38 34 3 2 3 <b>124</b> 4 4 4 3 3 3 3	30 21 4 3 4 3 102 4 3 2 4 3	30 21 3 3 4 3 104 4 3 2 3 3 3
Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial <b>Overall environmental weighted total</b> <b>FINANCIAL WEIGHT</b> Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical	10 10 1 1 1 1 1 1 1 1 1 1 1	8 7 8 2 1 3 3 7 7 8 7 8	29 31 3 3 4 3 112 4 4 3 3 3 3	35 37 3 1 3 121 4 4 4 4 3	38 34 3 3 2 3 124 4 4 4 3 3	30 21 4 3 4 3 102 4 4 3 2 4	30 21 3 3 4 3 104 

1.3 Non-rad hazards and risks     3     4     controlled process.       2. Public HAS collective     2.1 Routher radiation doses     4     4       3.3 Non-rad hazards and risks     4     4     Controlled process.       3.3 Non-rad hazards and risks     7     4     4       3.3 Non-rad hazards and risks     7     26     27       Group 2: Environmental impact     7     7       4.4 4     2     7       Group 2: Environmental impact     3     4       4.4 4     2     7       4.5 Nusance     3     4       4.7 Hysical environment     4.1 Ar quality     4       4.8 Use and risks     3     4       4.4 Use of atural resources     3     2       4.6 Use of atural resources     3     2       5. Fora, and fauna     5.1 Preservation of ecosystems     2     3       6 Environmental objectives     6     7       6. Environmental objectives     7     3     4       6. Environmental objectives     1     8     23       7. Dra, and fauna     5.1 Preservation of ecosystems     2     3       7. Dra and fauna     6.1 Waste volume     3     4       6. Environmental objectives     1     8     4     3    <						/ / .0 /
Group 1: Human health and selety     Image: Control of groups of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of the selection of						
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Group 1: Human health and setty     Image: Controlled process.       1: Public HSS individual     1: Routine radiation doese     4     4       1: Non-rad hazards and rake.     3     4     4       2: Dublic HSS collective     2: Routine radiation doese     4     4       3: Worker HSS individual     3: Routine radiation doese     4     4       3: Worker HSS individual     3: Routine radiation doese     4     4       3: Worker HSS individual     3: Routine radiation doese     4     4       3: Worker HSS individual     3: Routine radiation doese     4     4       3: Worker HSS individual     3: Routine radiation doese     3: Routine radiation doese     4       4: Statistical Routine radiation doese     3: Routine radiation doese     4: 4     4: Controlled processe.       3: Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine Routine					8	
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Group 1: Human health and setty     Image: Controlled process.       1: Public H&S individual     1: Rectar indiation doale     4     4       1: Non-rad hazards and risks     4     4       2: Rodic H&S colocitive     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     3     4       4: A regulity     3     4     2       6: Environment     4: A regulity     3     4       5: Fore and fauna     5     7       6: Env			nb-a	5		
Group 1: Human health and setty     Image: Controlled process.       1: Public H&S individual     1: Rectar indiation doale     4     4       1: Non-rad hazards and risks     4     4       2: Rodic H&S colocitive     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     4     4       3: Worker H&S individual     1: Rectar indiation doale     3     4       4: A regulity     3     4     2       6: Environment     4: A regulity     3     4       5: Fore and fauna     5     7       6: Env	∆ttributes	Sub-attributes	lo. s	3.50	/ Real	Scoring Notes
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2. Public HaS collective     2. Routine radiation doese     4     4     aurnmation terms).       3. Worker HAS individual     2. Rout acceler risks     4     4       3. Worker HAS individual     3. Rour-and hazards and risks     4     4       3. A Non-and hazards and risks     7     2     2       Group 2: Environmental impact     7     2     2       4. Physical environment     4. A quality     3     4       4. Physical environment     4. A quality     3     4       4. Physical environment     4. B quality     3     4       4. Physical environment     4. B quality     3     4       4. B load of allowing interventions     3     2       4. B load of allowing intervention     3     2       4. B load of allowing intervention     3     2       5. Flora and fauna     5. Procental resources     3     4       6. Environmental objective     1     1     Both diagostal or decide.       6. Streamentie and colorities     2     4       6. Streamentie and colorities     3     2       6. Streamentie and colorities     3     4       6. Streamentie and colorities     3     2       6. Streamentie and colorities     3     2       6. Streamentie and colorities		1.3 Non-rad hazards and risks		3	4	
3. Worker H&S individual       3.1 Flauther radiation does       4       4       4       4       4       4       6         3.2 Feat account risks       3.3 Non rad hazards and risks       3       3       3       3       3       Some residual risks - but exposure to pre-bagged mat breatment - additional risk (not sufficient to discriminate treatment - additinate risk (not sufficient to discriminate treatment - a	2. Public H&S collective	2.1 Routine radiation doses		4	4	
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Totalis         7         8         27           Group 2: Environmental impact         7         7         7           4. Physical environment         4.1 Afr quality         4         4         2           4. Physical environment         4.1 Afr quality         3         4         2           4.2 Stand quality         3         4         2         2           4.2 Stand quality         3         4         2         2           4.3 Stand quality         3         4         2         2           4.4 Stand quality         3         4         2         2           4.5 Nuscance         3         2         Thermal treatment more energy intensive than LLWR intension that the sources         3         2           5. Flora and fauna         5.1 Preservation of accogateme         3         4         1           6. Grownards and baset herarchy         1         1         1         1           6. Standard roduction         2         4         3         4           6. Standard found availability of potion         3         3         2         1           6. Standard found availability of potion         3         3         3         1           6. Throwing pra				_	_	Some residual risks - but exposure to pre-bagged materials. Thermal
Group 2: Environmental impact         7         -         -           4. Prysical environmental impact         4.1 & quality         3         4           4.2 Water quality         3         4         -           4.2 Water quality         3         4         -           4.2 Situaroce         3         2         -           4.4 Line quality         3         4         -           4.5 Nuisance         3         2         -           4.6 Use of natural resources         3         2         -           4.7 Transport         3         4         -         -           5. Fore and fauna         5. Freesevation decosystems         2         3         -           6. Environmental objectives         6         -         -         -           6. Environmental objectives         6         -         -         -           6. Environmental objectives         6         -         -         -         -           6. Environmental objectives         6         -         -         -         -           6. Environmental objectives         6         -         -         -         -           6. Environmental objectives         6						treatment - additional risk (not sufficient to discriminate).
Group 2: Environmental impact         Impact           4. Physical environment         4.1 Air quality         4         2           4.2 Water quality         3         4           4.3 Land quality         3         4           4.4 Yeyal impact         3         2           4.4 Veyal impact         3         2           4.5 Nusame         3         2           4.6 Use of natural resources         3         2           5. Flora and fauna         5.1 Preservation of ecosystems         2         3           6. Environmental objectives         3         4         23           6. Environmental objectives         3         4         3           7. Flora and fauna         5.1 Preservation of ecosystems         2         4           6. Environmental objectives         3         4           6. Environmental objectives         3         4           6. Environmental objectives         3         3           6. Environmental objectives         3         4           7         2         4         3           6. Environmental objectives         3         3         2           6. Environmental objectives         3         3         3		Iotais	7	20	27	
4. Physical environment         4.1 Ar quality         4         2           4.2 Wate quality         3         4           4.3 Land quality         3         4           4.4 Visual impact         3         2           4.6 Use of natural resources         3         2           4.6 Use of natural resources         3         2           4.7 Transport         3         4           5. Flora and fauna         5.1 Preservation of ecosystems         2         3           6. Environmental objectives         0         1         1           6. Environmental objectives         3         4         2           6. Concontrata and contain         3         3         4           6. A Concontrata and contain         3         3         3           6. E. Water hierarchor of scocity waters         4         3         Thermal treatment will involve some scrubbing of efflux           6. A Concontrata and contain         3         3         4         2           7         1         1         Both disposal endpoints.         6           6. A Concontrata and contain         3         3         4         2           7         Containtes and contain         3         3			<u> </u>			
A 2 Water quality     A 3 4     A 4 Visual impact     A 5 Ukisance     A 5 Visiance     A 5 Visiance		pact	Ĺ			
4.3 Land quality     3     4       4.4 Visual impact     3     2       4.5 Nuisance     3     2       4.6 Use of natural resources     3     2       4.7 Transport     3     4       5. Flora and fauma     1.7 resolvation of ecceystems     2     3       6. Group 3: Environmental objectives     6     2     3       6. Environmental objectives     1     1     1     8 of disposal endpoints.       6. Environmental objectives     1     1     1     8 of disposal endpoints.       6. Environmental objectives     1     1     1     8 of disposal endpoints.       6. Concentrate and contain     3     3     4       6. Concentrate and contain     3     3     1       6. Greenhouse gas emmissions     3     2     4       7     7     7     7     7       7. Viabitity     7.1 Maturity of technology     3     3     3       7. Viabitity     7.1 Maturity of technology     3     3     3       7. Viabitity     7.2 Continued anvailability of option     3     3     3       7. Viabitity     7.3 Throughput/capacity of option     3     3     3       7. Viabitity     7.3 Throughput/capacity of option     3 <td< td=""><td>4. Physical environment</td><td></td><td></td><td></td><td></td><td></td></td<>	4. Physical environment					
4.4 Visual impact     3     2       4.5 Nusiance     3     2       4.6 Solusion of natural resources     3     2       7.7 Transport     3     2       5.1 Preservation of ecosystems     2     3       6.1 Solution of ecosystems     2     3       7.7 Transport     3     4       6.1 Preservation of ecosystems     2     3       7.8 Fora and faura     5.1 Preservation of ecosystems     2       8     7     3     4       6.1 Preservation of ecosystems     3     4       6.2 Nastis Interactly     1     4       6.3 Concentrate and contain     3     4       8.4 Concentrate and contain     3     4       8.5 Generation of secondary wastes     4     3       9.6 Operating and contain     2     4       9.7 Proximity principle     7     7       10.8 G contrative and contain     3     3       11.1 Containing project risk to NDA     3     3       12.2 Viability     7.1 Maturity of technology     4     2       13.1 Viability     7.1 Maturity of technology     4     2       14.1 Naturity of technology     4     2       15.1 Provinity principle     3     3       10.2 Minimising project r						
4.5 Nuisance       3       2       Thermal treatment more energy intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than the intensive intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive than LLWR intensive the intensive the intensive the intensive than LLWR intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the intensive the						
4.6 Use of natural resources       3       Thermal treatment more energy intensive than LLWR interval treatments.         4.7 Transport       3       4         5. Flora and fauna       5.1 Preservation of ecosystems       2       3         6.1 Second and fauna       5.1 Preservation of ecosystems       2       3         7 total       7 total       7 total       7 total       7 total         8       7       8       7       7       7         8       7       8       7       7       8       7         9       Environmental objectives       6       1       1       1       8       8       7         6       Comp 3: Environmental objectives       6       1       1       1       8       8       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7       7			-			
4.6 Use of natural resources     3     2     requirements.     1       4.7 Transport     3     4     IUIW near Drigg is relatively local. Thermal treatment       5. Flora and fauna     5.1 Preservation of ecosystems     2     3       6. Environmental objectives     8     2       6. Environmental objectives     1     1       6. Environmental objectives     1     1       6. Environmental objectives     1     1       6. Concerrate and contain     3     4       6. Scanceration of secondary watee     3     1       6. Scanceration of secondary watee     3     2       6. Proximity principle     1     1       7. Vabity     7     1     2       7. Vabity     7.1 Maturity of technology     4     2       7. Vabity     7.2 Continued availability of option     3     3       7.3 Throughput/capacity of option     3     3     3       7.4 Likelihood of meeting CFA     3     4     3     3 <td></td> <td>T. UNUIDALIGE</td> <td><math>\vdash</math></td> <td>3</td> <td></td> <td>Thermal treatment more energy intensive than LLWR conditioning</td>		T. UNUIDALIGE	$\vdash$	3		Thermal treatment more energy intensive than LLWR conditioning
4.7 Transport     3     LLWR nex Digits is relatively local. Thermal treatment is followed by local disposal of residue.       5. Flora and fauna     5.1 Preservation of ecosystems     2     3       Totals     2     3       Totals     2     3       Group 3: Environmental objectives       6.1 Waste volume     3     4       6.2 Waste hierarchy     1     1       6.3 Hazard reduction     2     4       6.4 Concentrate and contain     3     3       6.5 Generation of ecosystems     3     2       Totals       7     7       Group 4: Technical       7. Viability     7.1 Maturity of technology     4       7. Viability     7.1 Maturity of technology     4     2       7. Viability     7.1 Maturity of technology     4     2       7. Viability     7.1 Maturity of technology     4     2       8. Nuclear Safety     8.1 Likelihood of meeting CFA     3     3       10. Programme     10.3 Stacharge of NDA liabilities     3     4     4       11. Local community     11.1 Economic impacts     3     3       11. Local community     11.1 Economic impacts     3     3       11. Local community     11.1 Economic im		4.6 Use of natural resources		3	2	
5. Flora and fauna       5.1 Preservation of ecosystems       2       3         Totals       24       23         Group 3: Environmental objectives       8       4         6. Environmental objectives       3       4         6. Groentalon of secondary water       4       3         6. Groentalon of secondary water       4       3         6. Groentalon of secondary water       4       3         6. Groentalon of secondary water       7       4         6. Groentalon of secondary water       7       7         6. Groentalon of secondary water       7       7         7. Vability       7.1 Mutuity of technology       4       2         7. Vability       7.1 Mutuity of technology       4       2         7. Vability       7.1 Mutuity of technology       4       2         7. Vability       7.1 Mutuity of technology of polion       3       3         8. Nuclear Safety       8.1 Likelihood of meeting CFA       3       4       3         10. Programme       10.1 Scheduing variance compared to LTP <td></td> <td></td> <td>1</td> <td></td> <td></td> <td>LLWR near Drigg is relatively local. Thermal treatment on-site</td>			1			LLWR near Drigg is relatively local. Thermal treatment on-site
Totals         24         23           Group 3: Environmental objectives         6						followed by local disposal of residue.
Group 3: Environmental objectives     6.1 Waste volume     3     4       6. Environmental objectives     6.1 Waste volume     3     4       6. Environmental objectives     6.1 Waste volume     3     4       6. A Decentrate and contain     2     4     3       6. A Concentrate and contain     3     3       6. G Greenhouse gas emmissions     3     2       6. 7 Proximity principle     2     4       7     16     21       6. 7 Proximity principle     16     2       7. Viability     7.1 Maturity of technology     4     2       8. Nuclear Safety     8.1 Likelihood of meeting CFA     3     4       10. Programme     10.1 Scheduling variance compared to LTP     3     3       10.2 Discharge of NDA liabilities     3     4     4       10.4 Consistency with site End State <td>5. Flora and fauna</td> <td></td> <td></td> <td></td> <td></td> <td></td>	5. Flora and fauna					
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6. Environmental objectives       6.1 Waste volume       3       4         6. 2 Waste hierarchy       1       1       Bath disposal endpoints.         6. 4 Concentrate and contain       3       3         6. 5 Generation of secondary wastes       4       3       Thermal treatment will involve some scrubbing of effluit         6. 6 Greentouse gas emmissions       3       2       4         6. 7 Proximity principle       7       2       4         7. Vlability       7.1 Maturity of technology       4       2         7. Vlability       7.1 Maturity of technology       4       2         7. Vlability       7.1 Maturity of option       3       3         7. Vlability       7.1 Maturity of option       3       3         7. Vlability       7.1 Maturity of option       3       3         8. Nuclear Safety       8.1 Likelihood of meeting CFA       3       4       Uncertainties related to LLWR acceptance of tritiated a therment 1.0.1 Scheduling variance compared to LTP       3       2         10. Programme       10.1 Scheduling variance compared to LTP       3       4       LWR disposal discharges NDA liabilities most quickly         10.2 Minimising project risk to NDA       3       3       4       4       4         10.2. Mi			8			
6. Environmental objectives       6.1 Waste volume       3       4         6. 2 Waste hierarchy       1       1       Bath disposal endpoints.         6. 4 Concentrate and contain       3       3         6. 5 Generation of secondary wastes       4       3       Thermal treatment will involve some scrubbing of effluit         6. 6 Greentouse gas emmissions       3       2       4         6. 7 Proximity principle       7       2       4         7. Vlability       7.1 Maturity of technology       4       2         7. Vlability       7.1 Maturity of technology       4       2         7. Vlability       7.1 Maturity of option       3       3         7. Vlability       7.1 Maturity of option       3       3         7. Vlability       7.1 Maturity of option       3       3         8. Nuclear Safety       8.1 Likelihood of meeting CFA       3       4       Uncertainties related to LLWR acceptance of tritiated a therment 1.0.1 Scheduling variance compared to LTP       3       2         10. Programme       10.1 Scheduling variance compared to LTP       3       4       LWR disposal discharges NDA liabilities most quickly         10.2 Minimising project risk to NDA       3       3       4       4       4         10.2. Mi	Group 3: Environmental ob	iectives				
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<b>UNWEIGHTED</b> Group 1: Human health and safety	1	7	26	27	-
Group 2: Environmental impact	1	8	20	23	-
Group 3: Environmental objectives	1	7	18	21	-
Group 4: Technical	1	8	26	25	
Group 5: Socio-economic	1	2	6	6	
Group 6: Regulatory	1	1	4	2	
Group 7: Financial	1	3	10	7	
Overall unweighted total			114	111	
TEAM WEIGHT					
Group 1: Human health and safety	10	7	37	39	1
Group 2: Environmental impact	10	8	30	29	
Group 3: Environmental objectives	5	7	13	15	-
Group 4: Technical	8	8	26	25	
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	5	1	20	10	
Group 7: Financial	8	3	27	19	
Overall team weighted total			156	139	-
TECHNOLOGY WEIGHT					
Group 1: Human health and safety	10	7	37	39	
Group 2: Environmental impact	1	8	3	3	-
Group 3: Environmental objectives	1	7	3	3	
Group 4: Technical	10	8	33	31	-
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	1	1	4	2	
Group 7: Financial	10	3	33	23	
Overall technology weighted total			116	104	-
Group 1: Human health and safety	10	7	37	39	-
Group 2: Environmental impact	10	8	30	29	-
Group 3: Environmental objectives	10	7	26	30	-
Group 4: Technical	1	8	3	3	1
Group 5: Socio-economic	1	2	3	3	1
Group 6: Regulatory	1	1	4	2	
Group 7: Financial	1	3	3	2	
Overall environmental weighted total			106	108	
FINANCIAL WEIGHT					1
Group 1: Human health and safety	1	7	4	4	1
Group 2: Environmental impact	1	8	3	3	1
Group 3: Environmental objectives	1	7	3	3	1
Group 4: Technical	1	8	3	3	]
Group 5: Socio-economic	1	2	3	3	]
Group 6: Regulatory	1	1	4	2	4
Group 7: Financial	10	3	33	23	4
Overall financial weighted total			53	41	

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3.3 Non-radi hazards and roka         3         4         3         3           Group 2: Environmental impact         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7         7	3. Worker H&S individuals							
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4: Projectal environment         4: 3 Auro, analy         3         4         3         3           4: 2: Value quality         3         4         3         3         4           4: 2: Value quality         3         4         3         3         4           4: 5: Values quality         3         4         3         3         4           4: 5: Values quality         3         4         3         3         3           4: 5: Values quality         3         5         7         30         2         2           5: Flore and fauna         1: Treation encode of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutions of exclutio			,					
42 Wate quality         3         4         3         3         3           42 Utag impact         1         2         4         4         3           44 Utag impact         1         2         4         4         3           44 Utag impact         1         2         4         4         3           44 Utag impact         1         2         3         3         Herrerston most energy intensive.           44 Utag impact         1         3         5         2         2           Form and fauna         3         6         2         3         3           Form and fauna         1         1         1         Incircuton rout energy intensive.           6. Environmental Objectives         6. Waste volume         4         3         3         3           6. Environmental objectives         6. Waste volume         4         3         3         3         3           6. A Concentrinate and contain         4         3         3         3         3         3           6. G Greenhouse gas emmissions         1         4         3         3         3         3         3           7         Continuat avaiable         contain<				3	4	3	3	
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4.6 Nuisance         2         3         3         3         Proceeding of nuture responses           4.7 Transport         3         5         2         2         3         3         Proceeding of nuture responses         1           5. For and faunt         5. Preservormental objectives         8         27         20         23         24           6. Environmental objectives         8         1         1         1         Incidential objectives         1         1         Incidential objectives         1         1         Incidential objectives         1         1         Incidential objective of nuture response								
4         Langeont         2         3         3         3         3         1         Primeration most energy intensive.           5. Flora and fauna         5. Preservation of acosystems         3         4         3         4         3         4           5. Flora and fauna         5. Preservation of acosystems         70135         27         30         28         24           6. Environmental objectives         1         1         Environmental objectives         1         1         Environmental objectives         1         1         Environmental objectives         1         1         Environmental objectives         1         1         Environmental objectives         1         1         Environmental objective         1         1         Environmental objective on thomage to involve energy succeary and the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective on the objective			$\vdash$					
5. Flora and fauna         5. 1 Preservation of eccesystems         3         4         3         4         3         4           706/at         21         30         22         24         24         24           706/at         21         1         1         Processon         24         24           6. Environmental objectives         6.1 Waste volume         4         3         3         2           6. Environmental objectives         6.1 Waste volume         4         3         3         3           6. 24 Vaste hierardin         4         2         1         1         Indirection > disposal options - not thought to involve energy recovery to instant end outcomentation - disposal options - not centration - disposal options - not recentration - disposal options - not recentration - disposal options - not energy recovery to instant end non-instant end non-		4.6 Use of natural resources		2	3	3	3	Incineration most energy intensive.
Totals         21         30         23         24           Broup 3: Environmental objectives         8         4         3         3           6: Environmental objectives         1         1         1         1           6: Environmental objectives         6: Wate volume         4         3         3           6: Environmental objectives         6: Wate volume         4         1         1         1           6: A totacat reduction         4         2         1         1         1         Incineration > disposal options currently available - prompt horizeration and LUMR disposal leads to containment to disposal leads to containment to expector sever feactule management.           6: 4 Concentrate and contain         4         3         3         gesetons over feactule management.           6: 6 A concentrate and contain         4         3         3         gesetons over feactule management.           6: 6 A concentrate and contain         4         3         3         abatement technologies.         Incineration and VLW more distant than LLWR.           7         7         7         7         7         7         7           8: Outer Step (Step			$\square$					
Group 3: Environmental objectives         6.         Fundamental objectives								
6. Environmential objectives     6.1 Waste volume     4     3     3       6. 2. Waste hierarchy     2     1     1     1       6. 3. Hazard reduction     4     2     2     4       6. 3. Hazard reduction     4     2     2     4       6. 4. Concentrate and contain     4     3     3     3       6. 6. Generation of sconday wastes     4     3     3     3       6. 6. Greenhouse gas emmissions     1     4     3     3       6. 7. Proximity principle     2     5     2     3     incineration and VLW more distant than LLWR.       7     7     7     7     7     7     7       Group 4: Technical     7     7     7     7       7     1     4     3     3     3       8. Nuclear Stately     7     7     7     7       7. Viabity     7.1 Maturity of technology     3     3     3     3       7. Viabity     7.2 Continues transmithing of option     3     3     3     3       8. Nuclear Statey     1.1 Licelinoco of meeting CFA     4     3     3     3       10. Drogramme     10.2 Minimising project risk to NDA     3     3     3     3       10. A			8					
6. Environmental objectives       6.1 Waste volume       4       3       3       3         6. Environmental objectives       6.2 Waste hierarchy       2       1       1       1       Incineration - disposal options currently available - prompt incineration and LUWR disposal options currently available - prompt incineration and LUWR disposal options currently available - prompt incineration and container in the disposal options - node in technologies.         6.4 Concentrate and contain       4       3       3       3       abstement technologies.       moineration and LUWR disposal options - moden technologies.         6.6 Greenhouse gas emmissions       1       4       3       3       3       abstement technologies.         6.7 Proximity principle       2       5       2       3       incineration and VLW more distant than LLWR.         7       7       7       7       7       7       7         Group 4: Technical       71 Maturity of technology       3       3       3       3         7. Viability       7.1 Maturity of technology       3       3       3       3       3         8. Nuclear Sately       8.1 Likelinood of meeting CFA       4       3       3       3       3         10. Departure       10.2 Minimising project risk to NDA       3       3       3	Group 3: Environmental obj	ectives	$\vdash$				1	
6.3 Hazard reduction     4     2     2     4     hazard reduction     4     3     3     hazard reduction; other option and periation; other options, other option and periation; other options, other option; other option and vLLW more distant than LLWR.       6.4 Concentrate and contain     4     3     3     abatement technologies.       6.5 Generation and vLLW option     7     7     20     incinentation and vLLW more distant than LLWR.       7     7     7     20     incinentation and vLLW more distant than LLWR.       7     7     7     20     incinentation; disposal option; other option; and vLLW more distant than LLWR.       7.5 Throughpul/clapacity option     3     3     3     3     4       8. Nuclear Safety     8. Likelihood of meeting CFA     4     3     3     3       10.4 Densing project risk to NDA     3     3     3     3     3       10.6 Densing of NDA     3     3     3     3     3				4	3	3	3	
6.3 Hazard reduction         4         2         2         4         hazard reduction, other options not yet available.           6.4 Concentrate and contain         4         3         3         guestions over leachate management.           6.5 Generation of secondary wastes         4         3         3         abatement technologies.           6.6 Greenhouse gas emissions         1         4         3         3           6.7 Proximity principle         2         5         2         3           7         7         7         7         7         7           6.7 Proximity principle         7         7         7         7         7           7. Viability         7.1 Batting of prinon         3         3         4         3         3           8. Nuclear Stefy         8.1 Likelhood of meding GFA         4         3         3         3         3           10. Programme         10.1 Scheduling variance compared to LTP         3         3         3         3         3           10.3 Discharge of NDA liabilities         4         2         3         3         3         3           11. Local community         11.1 Economic impacts         3         3         3         3 <td< td=""><td></td><td>6.2 Waste hierarchy</td><td></td><td>2</td><td>1</td><td>1</td><td>1</td><td>Incineration &gt; disposal options - not thought to involve energy recovery.</td></td<>		6.2 Waste hierarchy		2	1	1	1	Incineration > disposal options - not thought to involve energy recovery.
6.4 Concentate and contain         4         3         3         3         3         3         3         4         3         3         3         4         3         3         4         3         3         4         1         1         1         1         1         1         1         1         1         4         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         1         4         3         3         1         4         3         3         1         4         3         3         1         4         3         3         1         4         3         3         1         4         3         3         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1 </td <td></td> <td>6.3 Hazard reduction</td> <td></td> <td>4</td> <td>2</td> <td>2</td> <td>4</td> <td></td>		6.3 Hazard reduction		4	2	2	4	
6.6 Greenhouse gas emmissions         1         4         3         3         Indicertation and vLLW more distant than LLWR.           6.7 Proximity principle         7         21         21         21         21         20           Group 4: Technical         7         -         -         -         -         -           7. Viability         7.1 Maturity of technology         3         3         3         4         3         3           7. Viability         7.1 Continued availability of option         3         3         3         4         3         3           8. Nuclear Safety         8.1 Likelihood of meding CFA         4         3         3         3         3         10         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -								questions over leachate management. Incineration less waste than disposal options - modern technology and
6.7 Proximity principle         2         5         2         2         3         Incineration and VLLW more distant than LLWR.           Totals         21         21         17         20           Group 4: Technical         7         1         Maturity of technology         3         3         3         4           7. Vlability         7.1 Maturity of technology         3         3         3         4           7. Zontinued availability of option         3         3         3         4         3           8. Nuclear Safety         8.1 Likelihood of meeting CFA         4         3         3         3         3         3         4           10. Programme         10.3 Site/ariance compared to LTP         3         3         3         3         3         10         Desite disposal - long-term continuing on-site liability.           10.4 Considency with site End State         4         2         4         3         3         3           11.4 Colonomic impacts         3         3         3         3         3         3           11.4 Considency with site End State         4         2         3         3         3         3           11.1 Economic impacts         3         3								abatement technologies.
Group 4: Technical         7             Group 4: Technical         7.1 Maturity of technology         3         3         3         4           7. Vability         7.1 Maturity of technology         3         3         3         4           7. Vability         7.1 Maturity of technology         3         3         3         4           7. Throughpulcopacity of option         3         3         3         3         3           8. Nuclear Safety         8.1 Likelihood of meeting CFA         4         3         3         3           10. Programme         10.2 Minimiging project risk to NDA         3         3         3         3           10.4 Consistency with site End State         4         2         4         3         0n-site disposal - long-term continuing on-site liability.           11.4 Consistency with site End State         4         2         3         3         3           11.1 Economic impacts         3         3         3         3         3         3           11.1 Economic impacts         1         3         3         3         3         3           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         3		6.7 Proximity principle		2	5	2	3	Incineration and vLLW more distant than LLWR.
7. Vlability       7.1 Maturity of technology       3       3       3       4         7. 2 Continued availability of option       3       3       3       0n-site facility not available - scoring consistent with other options.         7. 1 Maturity of technology       6       3       3       3       0n-site facility not available - scoring consistent with other options.         8. Nuclear Safety       8.1 Likelihood of meeting CFA       4       3       3       3         10. Programme       10.1 Scheduling variance compared to LTP       3       3       3       3         10.2 Minimising project risk to NDA       3       3       3       3       0n-site disposal - long-term continuing on-site liability.         10.4 Consistency with site End State       4       2       3       4       3       3         6roup 5: Socio-economic       11. Local community       11.1 Economic impacts       3       3       3       3       3         11. Local community       11.1 Collower and heritage       3       3       3       3       3       3       3         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5       requires more permissions (under site responsibility) than vLLW.         13. Financial </td <td></td> <td>Totals</td> <td>7</td> <td>21</td> <td>21</td> <td>17</td> <td>20</td> <td></td>		Totals	7	21	21	17	20	
7. Vlability       7.1 Maturity of technology       3       3       3       4         7. 2 Continued availability of option       3       3       3       0n-site facility not available - scoring consistent with other options.         7. 1 Maturity of technology       6       3       3       3       0n-site facility not available - scoring consistent with other options.         8. Nuclear Safety       8.1 Likelihood of meeting CFA       4       3       3       3         10. Programme       10.1 Scheduling variance compared to LTP       3       3       3       3         10.2 Minimising project risk to NDA       3       3       3       3       0n-site disposal - long-term continuing on-site liability.         10.4 Consistency with site End State       4       2       3       4       3       3         6roup 5: Socio-economic       11. Local community       11.1 Economic impacts       3       3       3       3       3         11. Local community       11.1 Collower and heritage       3       3       3       3       3       3       3         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5       requires more permissions (under site responsibility) than vLLW.         13. Financial </td <td></td> <td></td> <td>/</td> <td></td> <td></td> <td></td> <td></td> <td></td>			/					
7.2 Continued availability of option       3       3       3       3       3       0n-site facility not available - scoring consistent with other options.         8. Nuclear Safety       8.1 Likelihood of meeting CFA       4       3       3       3       3       3       3       3         10. Programme       10.1 Scheduling variance compared to LTP       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3		7.1 Maturity of toobpology		2	2	2	4	
R. Nuclear Stately         8.1 Likelihood of meeting CFA         4         3         3         Nuclear Stately         8.1 Likelihood of meeting CFA         4         3         3         3         Nuclear States         8.1 Likelihood of meeting CFA         4         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3	7. Vidbility							On-site facility not available - scoring consistent with other options.
10. Programme       10.1 Scheduling variance compared to LTP       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3		7.3 Throughput/capacity of option		3	4	3	3	
Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview         Interview <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>No particular issues related to conditions for incineration.</td></t<>								No particular issues related to conditions for incineration.
10.3 Discharge of NDA liabilities         4         2         4         3         On-site disposal - long-term continuing on-site liability.           10.4 Consistency with site End State         4         2         3         4           10.4 Consistency with site End State         4         2         3         4           10.4 Consistency with site End State         7         23         25         26           8         7         23         25         26           6         6         6         6         6         6           11. Local community         11.1 Economic impacts         3         3         3         3           11.2 Culture and heritage         3         3         3         3         3           11.2 Culture and heritage         3         3         3         3         3           11.2 Culture and heritage         2         6         6         6         6           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         3         5           12. Acceptability         12.1 Likelihood of gaining regulatory acceptance         4         2         3         5           13. Total undiscounted cost         1         2 </td <td>To. Flogranine</td> <td>10.2 Minimising project risk to NDA</td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td>	To. Flogranine	10.2 Minimising project risk to NDA	-					
Totals         27         23         25         26           Group 5: Socio-economic         8         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         <		10.3 Discharge of NDA liabilities						On-site disposal - long-term continuing on-site liability.
Group 5: Socio-economic         8         ////         ////           11. Local community         11.1 Economic impacts         3         3         3         3         3         1           11. Local community         11.1 Economic impacts         3         3         3         3         3         3         1           11. Local community         11.1 Economic impacts         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3			-					
11. Local community       11.1 Economic impacts       3       3       3       3       3         11.2 Culture and heritage       3       3       3       3       3       3         11.2 Culture and heritage       11.2 Culture and heritage       3       3       3       3       3         11.2 Culture and heritage       2       1       1       1       1       1       1         Group 6: Regulatory issues       1       2       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1								
11. Local community       11.1 Economic impacts       3       3       3       3       3         11.2 Culture and heritage       3       3       3       3       3       3         11.2 Culture and heritage       11.2 Culture and heritage       3       3       3       3       3         11.2 Culture and heritage       2       1       1       1       1       1       1         Group 6: Regulatory issues       1       2       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1	Group 5: Socio-economic		$\vdash$					
Totals       6       6       6       6         Group 6: Regulatory issues       2       -       -       -         12: Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5         12: Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5         12: Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5         13: Financial       1       -       -       -       -       -         13: Financial       1       -       -       -       -       -         13: Financial cost       13.1 Total undiscounted cost       3       2       3       3       Rate of spend for on-site disposal involves additional construction costs.         13: Financial cost       13.2 Rate of spend compared to LTP       3       2       3       3       Rate of spend for on-site disposal accelerated relative to LTP.         13: Stability of cost estimates       3       4       3       2       a       3       Con-site disposal costs for LLWR most uncertain; other sites reflect level of third party dependence.         13: Stability of cost estimates       3       4       3       2       a       - </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>								
Group 6: Regulatory issues       2       1       1         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5         12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5         13.1 Total undiscounted cost       1       1       1       1       1         13. Financial       13.1 Total undiscounted cost       3       2       3       3       0n-site disposal involves additional construction costs.         13.2 Rate of spend compared to LTP       3       2       3       3       Disposal costs for LLWR most uncertain; other sites reflect level of third party dependence.         13.3 Stability of cost estimates       3       4       3       2       3         13.3 Stability of cost estimates       3       4       3       2       4         10       110       9								
12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5       requires more permissions (under site responsibility) than vLLW.         1       1       1       1       1       1       1       1       1         Group 7: Financial       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1 <t< td=""><td></td><td>Totais</td><td>2</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td></t<>		Totais	2	0	0	0	0	
12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5       requires more permissions (under site responsibility) than vLLW.         Image: Total       1       4       2       3       5       requires more permissions (under site responsibility) than vLLW.         Group 7: Financial       1       1       1       1       1       1         13. Financial cost       13.1 Total undiscounted cost       3       2       3       3       On-site disposal involves additional construction costs.         13. Financial cost       13.1 Total undiscounted cost       3       2       3       3       On-site disposal involves additional construction costs.         13. Financial cost       13.2 Rate of spend compared to LTP       3       2       3       3       Disposal costs for LLWR most uncertain; other sites reflect level of thrice party dependence.         13.3 Stability of cost estimates       3       4       3       2       3       4       3       2         14.       100       110       94       9       8       9       8       9       8       9       8         15.2 Rate of spend Compared to LTP       100       110       94       9       8       9       8       9       8	Group 6: Regulatory issues							
13. Financial cost     13.1 Total undiscounted cost     3     2     3     3     On-site disposal involves additional construction costs.       13.2 Rate of spend compared to LTP     3     2     3     3     Rate of spend for on-site disposal accelerated relative to LTP.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2       13.3 Stability of cost estimates     3     4     3     2       13.3 Stability of cost estimates     3     4     3     2       13.4 Total     9     8     9     8       14.1 Total     100     110     94     104       15.1 Total     109     118     103     112       15.1 Total     109     118     103     112       15.1 Total     109     118     103     112	12. Acceptability						5	LLWR route open; no difficulties with incineration foreseen; on-site facility requires more permissions (under site responsibility) than vLLW.
13. Financial cost     13.1 Total undiscounted cost     3     2     3     3     On-site disposal involves additional construction costs.       13.2 Rate of spend compared to LTP     3     2     3     3     Rate of spend for on-site disposal accelerated relative to LTP.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2       13.3 Stability of cost estimates     3     4     3     2       13.3 Stability of cost estimates     3     4     3     2       13.4 Total     9     8     9     8       14.1 Total     100     110     94     104       15.1 Total     109     118     103     112       15.1 Total     109     118     103     112       15.1 Total     109     118     103     112			1				<u> </u>	
13.2 Rate of spend compared to LTP     3     2     3     3     Rate of spend for on-site disposal accelerated relative to LTP.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2     party dependence.       13.3 Stability of cost estimates     3     4     3     2       13.3 Stability of cost estimates     3     4     3     2       13.3 Stability of cost estimates     9     8     9     8       13.4 Stability of cost estimates     100     110     94     104       13.4 Stability of cost estimates     100     110     94     104       13.4 Stability of cost estimates     109     118     103     112       14.4 Stability of cost estimates     0     2     0     2		13.1 Total undiscounted cost		3	2	3	3	On-site disposal involves additional construction costs.
Totals         9         8         9         8           3         3         3         4         4           Total less Group 7 scores         100         110         94         104           Overall Total         109         118         103         112           No. of 5s         0         2         0         2		13.2 Rate of spend compared to LTP		3	2	3	3	Rate of spend for on-site disposal accelerated relative to LTP. Disposal costs for LLWR most uncertain; other sites reflect level of third
3         100         110         94         104           Total less Group 7 scores         100         110         94         104           Overall Total         109         118         103         112           No. of 5s         0         2         0         2								party dependence.
Overall Total         109         118         103         112           No. of 5s         0         2         0         2		lotals		g	ð	у	ð	
Overall Total         109         118         103         112           No. of 5s         0         2         0         2		T-4/1 - 0 - 7		100	110		101	
No. of 5s 0 2 0 2		i otal less Group / scores	$\vdash$	100	110	94	104	
		Overall Total		109	118	103	112	
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UNWEIGHTED							
Group 1: Human health and safety	1	7	21	28	20	23	
Group 2: Environmental impact	1	8	21	30	23	24	
Group 3: Environmental objectives Group 4: Technical	1	7	21 27	21 23	17 25	20 26	
Group 5: Socio-economic	1	° 2	6	6	6	6	
Group 6: Regulatory	1	1	4	2	3	5	
Group 7: Financial	1	3	9	8	9	8	
Overall unweighted total			109	118	103	112	
TEAM WEIGHT		7	20	40	20	20	{
Group 1: Human health and safety	10 10	7 8	30 26	40	29 29	33	1
Group 2: Environmental impact Group 3: Environmental objectives	5	8	<u>∠</u> 6 15	38 15	29 12	30 14	1
Group 4: Technical	8	8	27	23	25	26	
Group 5: Socio-economic	1	2	3	3	3	3	
Group 6: Regulatory	5	1	20	10	15	25	
Group 7: Financial	8	3	24	21	24	21	
Overall team weighted total			145	150	136	152	
TECHNOLOGY WEIGHT							
Group 1: Human health and safety	10	7	30	40	29	33	
Group 2: Environmental impact	1	8	3	4	3	3	
Group 3: Environmental objectives	1	7	3	3	2	3	
Group 4: Technical	10	8	34	29	31	33	
Group 5: Socio-economic	1	2	3	3	3	3	
Group 6: Regulatory	1	1	4	2	3	5	
Group 7: Financial	10	3	30	27	30	27	
Overall technology weighted total			106	107	101	106	
ENVIRONMENTAL WEIGHT							
Group 1: Human health and safety	10	7	30	40	29	33	]
Group 2: Environmental impact	10	8	26	38	29	30	1
Group 3: Environmental objectives	10	7	30	30	24	29	
Group 4: Technical	1	8	3	3	3	3	4
Group 5: Socio-economic	1	2	3	3	3	3	{
Group 6: Regulatory Group 7: Financial	1	1 3	4	2	3	5 3	1
Overall environmental weighted total		3	3 100	3 118	3 94	3 105	1
	1		100	110	3-1	105	1
							]
FINANCIAL WEIGHT							
Group 1: Human health and safety	1	7	3	4	3	3	4
Group 2: Environmental impact	1	8	3	4	3	3	{
Group 3: Environmental objectives	1	7	3 3	3 3	2	3 3	{
Group 4: Technical Group 5: Socio-economic	1	8	3	3	3	3	1
	1	1	4	2	3	5	1
							J
Group 6: Regulatory Group 7: Financial	10	3	30	27	30	27	

1 Here provide output of the Case         5         4         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4			Г			/	1.	/ /	/	/ / /
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1. Pack and motion         1. Pack angle of door         4         4         4         4         4         and motion controls           2. Pack and motion         1         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4         0.4 <td< td=""><td>Group 1: Human health and</td><td>safety</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	Group 1: Human health and	safety								
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E. Mark Mark         Difference         4         4         3         3         3         1         The same part of the model mate in the part of the same part of the model mate in the part of the same same same same same same same sam		1.2 Rad accident risks	⊢	4	5	4	4	3	4	As above, except thermal treatment - additional potential accidental risk. SoLA decontamination non-hazardous operation; other options involve conditioning and
By Decker H45 sectors         1         Autor and the observed sector 5 has been for each of the observed sector 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors 5 has been for each of the observed sectors	2. Public H&S collective		$\vdash$							transport except on-site which does not involve the transport component. Follows pattern of low individual doses.
32 Ped pactor rule:         5         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4	3. Worker H&S individuals	3.1 Routine radiation doses		4	4	4	4	4		All options expected to lead to worker doses of 4 mSv per year or less (current practice).
a 3 box opt sageb ord rate         s         s         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d         d </td <td></td> <td></td> <td></td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>4</td> <td>All involve similar levels of waste treatment - in low risk batch processes. High T higher risk but takes place elsewhere.</td>				4	4	4	4	4	4	All involve similar levels of waste treatment - in low risk batch processes. High T higher risk but takes place elsewhere.
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I Trybill e vicenant         4         5         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4			7	30	30	26	27	25	26	
I Trybill e vicenant         4         5         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4	Group 2: Environmental imp	pact	Ħ							
All Water carby         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A         A	-		П	4	5	4	4	4	4	Decontamination wet operation to reduce aerial emmissions; conditioning processes similar for other options - on-site does not involve transport emissions.
4 2 Ware puby         5         4         5         4         5         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         <			П	-		-			-	Decontamination involves wet operations and liquid discharge (appropriately treated);
4.3 Lod axily         4         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         <		4.2 Water quality	$\square$	3	4	3	4	4	4	for leachate.
Image: Second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second		4.3 Land quality		4	2	3	2	2	2	land utilisation; high T returns very low volume so only single land use consideration
As Nance         A         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3<			Η							Decontamination in existing building; on-site only option where there is a potential
4.4 Nutrance       4       3       3       3       3       4       9       3       3       4       9       3       3       4       9       3       3       4       3       2       3       3       3       9       9       9       9       9       9       9       9       9       9       9       9       3       3       3       4       3       2       3       3       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       3       4       3       3       4       3       3       4       3       3       4       3       3       4       3       3       4       3       3       4       3       3       4       3       3       4       3       3       4       3       3       4       3 <t< td=""><td></td><td>T.T YISUAI IIIIPAUL</td><td>H</td><td>4</td><td>3</td><td>-</td><td>*</td><td>4</td><td>4</td><td>Decontamination benign process - some grinding noise; on-site disposal involves some</td></t<>		T.T YISUAI IIIIPAUL	H	4	3	-	*	4	4	Decontamination benign process - some grinding noise; on-site disposal involves some
4 L Uv diposi gatos:         4 L Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 Uv diposi gatos:         1 U		4.5 Nuisance	Ц	4	3	3	3	3	3	other options.
Ar 7 Issigned         4         5         2         3         4         4         5         2         3         4         4         4         5         7         8         7         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         87         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80         80		4.6 Use of natural resources		4	3	4	3	2	3	LLW disposal options - not required for decontamination and vLLW options.
5         Does and faires         4         4         3         4         8         Relied to off-site transport and berly engineering at walls disposit           For and faires         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1					_					Off-site disposal of wastes not required for on-site disposal; SoLA decontaminated waste could be disposed at local site; the vLLW site and 'other site' assumed to be
Tobble         37         30         28         29         24         27           Group 3: Environmental objectives         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1 <td>5. Flora and fauna</td> <td></td> <td>Η</td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>more distant than LLWR; thermal treatment at greatest distance (Sweden). Related to off-site transport and level of engineering at waste disposal facility.</td>	5. Flora and fauna		Η	-						more distant than LLWR; thermal treatment at greatest distance (Sweden). Related to off-site transport and level of engineering at waste disposal facility.
B         Existence         Image: Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of Content of C			8	31	30	26	29	24	27	
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6. Environmental algebres         6. Invaries         4         3         3         4         3         Speer comparation with work the mb is over incomposition if at may be appropriate compared atom in composition if at may be appropriate compared atom incomposition in at may be appropriate compared atom incomposition in at may be appropriate compared atom incomposition in at may be appropriate compared atom incomposition in at may be appropriate compared atom incomposition in a difference incompared atom incomposition incomposition in a difference incompared atom incomposition incomposition in a difference incompared atom incomposition incomposition incomposition in a difference incompared atom incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incomposition incompositene distribution incomposition incompositin incompositi										Decontamination and thermal treatment result in roughly equivalent reduction in the volume of LLW requiring disposal. Transfer to another site could include additional
6.2 Wate Nearchy       4       1       1       1       4       3       lengths in product processing or the based or compared to the following or the based or constraints of the second or product of the following or the based or constraints of the second or product of the following or the based or constraints of the second or product or the following or the based or constraints of the second or product or the following or the based or constraints of the second or product or the following or the based or constraints of the second or product or the following or the based or constraints of the second or product or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the following or the based or the based or the following or the based or the following or the based or the based or the based or the based or the based or the base	6. Environmental objectives	6.1 Waste volume		4	3	3	3	4	3	super-compaction which would then be scored similarly.
A L Consentiate and contain         4         3         3         4         3         3         4         3         4         3         4         4         4         4         4         5         Consentation and instanting potential for concentration for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - originations and for apport - origination and for apport - origination and for apport - origination - apport - approx - apportance - apportance - apportance - approx - apportance - apportance - approx - apportance - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx - approx -					1		1			recycle the product - although disposal also possibility.
B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B         B<         B         B<         B<			П							Decontamination and thermal treatment potential for concentration followed by
6.6 Beenhouse gas emission         9         3         3         3         2         3         Thereary processes, other option entry processes, other maximum, VLW and Constrained and one die degooid on de entry option of entry degooid and Univer Han LLWR. Thereal resulted at greated diater of the Handler of the entry option entry option entry option entry option entry option entry option.           6 Orop 4: Technical         7         22         24         24         24         24         24           7. Valiativy         7         24         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         4         2         2			П							Decontamination and vLLW segregation give rise to greatest secondary waste - liquid
Image: state in the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s			Ħ							Thermal treatment - use of high energy processes; other options neutral.
Group 4. Trochwical         Procession         Procession <t< td=""><td></td><td></td><td></td><td>•</td><td></td><td></td><td></td><td></td><td></td><td>equidistant and further than LLWR. Thermal treatment at greatest distance.</td></t<>				•						equidistant and further than LLWR. Thermal treatment at greatest distance.
7. Vability       7.1 Matury of technology       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4       4			7	27	22	10	21	25	22	
7.2 Continued availability of option     4     3     2     4     3     2     4     3     2     4     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3 <th< td=""><td></td><td>7.1 Maturity of toobsology</td><td>Ħ</td><td>4</td><td>4</td><td></td><td>4</td><td>4</td><td>4</td><td></td></th<>		7.1 Maturity of toobsology	Ħ	4	4		4	4	4	
2. 2 Continued availability of option     4     3     2     4     3     3     with or alte facility could be in generalize outhout be in generalize outhout and the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the ULW facility or or alter out of the UL	7. Viability	7.1 Maturity of technology	H	4	4	4	4	4	4	Decontamination under site control; LLWR option available over necessary timescale (5
0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0					•			•		on third party. Confident that on-site facility could be in operation within LTP - and more
7.3 Throughputcapacity of option     3     4     2     4     2     2     equire segregation and capacities uncertain.       8. Nuclear Safety     8.1 Lkoilhood of meeting GFA     4     4     4     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     4     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3		7.2 Continued availability of option	H	4	3	2	4	3	3	On-site facility would be built with necessary capacity; no problems anticipated with
8. Nuclear Safety     8.1 Lkelhood of meeting CFA     4     4     4     4     4     4     3     4     There may be issues related to the themal treatment requirements of appropriate sampling methodologies but once established - simple programme       10. Programme     10.1 Scheduling variance companed to LTP     3     3     4     3     3     4     10.1 Scheduling variance companed to LTP     3     3     2     4     2     2     Deposal at LLWR     Deposal at LLWR     Deposal at LLWR     10.2 Mininising project risk to NDA     3     3     2     4     2     2     Deposal at LLWR     Deposal at LWR     Deposal at LW		7.0 Throughout (and a site of a sting						•		on workforce. The vLLW, thermal treatment and transfer to another site options likely to
8. Nuclear Satety     8.1 Lekelhood of meeting CFA     4     4     4     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     4     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3		7.3 Throughput/capacity of option	H	3	4	2	4	2	2	There may be issues related to the thermal treatement requirements on metal type;
10. Programme     10. Scheduling variance compared to LTP     3     3     3     3     4     3     4     3     0 Disposal at LUWR current baseline but difficult to achieve; others involve additional uncertainty.       10.2 Minimising project risk to NDA     3     3     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     4     2     2     4     2     2     4     2     2     4     2     2     4     2     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3										appropriate sampling methodologies but once established - simple procedure; CfAs for
10.2 Minimising project risk to NDA     3     3     2     4     2     4     2     dependent on third parkets       10.3 Discharge of NDA liabilities     4     2     3     4     3     3     2     4     2     dependent on third parkets     Decontamination involves reputational risk alone while disposal at LLW R allow the erd state to be achieved and transfers to another site options involve potential delays.       10.3 Discharge of NDA liabilities     4     2     3     4     3     at the options involve septiational risk alone while disposal at LLW R allow the erd state to be achieved and transfers to another site options are available and does state.       10.4 Consistency with site End State     5     2     3     5     4     4       6roup 5: Socio-economic     8     2     3     3     3     3     3       11. Local community     11.1 Economic impacts     3     3     3     3     3     3     3       11. Local community     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3       12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3       13. Total     4     2     3     5     3     3     3     3       13. Total undiscou			$\vdash$							Disposal at LLWR current baseline but difficult to achieve; others involve additional
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10.3 Discharge of NDA liabilities     4     2     3     4     3     3     other options involve potential delays.       10.4 Consistency with site End State     5     2     3     5     4     4     department and transfers to another site options are available and does       10.4 Consistency with site End State     5     2     3     5     4     4     department and transfers to another site options are available and does       10.4 Consistency with site End State     5     2     3     5     4     4     department and transfers to another site options are available and does       6roup 5: Soclo-economic     8     25     23     33     24     25       11. Local community     11.1 Economic impacts     3     3     3     3     3     3     No change       11. Local community     11.1 Economic impacts     3     3     3     3     3     3     No change       11. Local community     11.2 Cuture and heritage     3     3     3     3     3     No change       12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3       12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3		10.2 Minimising project risk to NDA	Η	3	3	2	4	2	2	Decontamination involves reputational risk alone while disposal at LLWR implies promp
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Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation       Interpretation <thinterpretation< th="">       Interpretation       Interp</thinterpretation<>			]							Decontamination and disposal at LLWR allow the end state to be achieved. Thermal treatment and transfers to another site options are available and does not affect the end treatment and transfers to another site options are available and does not affect the end treatment and transfers to another site options are available and the state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the second state of the
Bit         Control         Co							5			state; disposal at the vLLW facility or on site imply potential or actual signicant departures from the end state - onsite greatest with additional on-site structure.
11. Local community       11.1 Economic impacts       3       3       3       3       3       3       3       No change         11.2 Culture and heritage       3       3       3       3       3       3       3       No change         Interval       6       6       6       6       6       6       6       6       6         Group 6: Regulatory issues       2       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1		Totals	8	30	25	23	33	24	25	
11. Local community       11.1 Economic impacts       3       3       3       3       3       3       3       No change         11.2 Culture and heritage       3       3       3       3       3       3       3       No change         Interval       6       6       6       6       6       6       6       6       6         Group 6: Regulatory issues       2       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1	Group 5: Socio-economic		А							
Totals         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6         6 <td></td> <td></td> <td>A</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>No change No change</td>			A							No change No change
12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3     implies planning regulatory framework in place; Transfe treatment and vLW require new practice to be established, while on-site disposal currently established process; decontamination - once demonstration of SoLA agreed regulatory framework in place; Transfe treatment and vLW require new practice to be established, while on-site disposal currently established process; decontamination - once demonstration of SoLA agreed regulatory framework in place; Transfe treatment and vLW require new practice to be established, while on-site disposal currently established process; decontamination - once demonstration of SoLA agreed regulatory framework in place; Transfe treatment and vLW require new practice to be established, while on-site disposal at the disposal disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at the disposal at			2	6		6	6		6	
12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3       12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3       12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3       12. Acceptability     12.1 Likelihood of gaining regulatory acceptance     4     2     3     5     3     3       12. Acceptability     12.1 Likelihood of gaining regulatory faramework in place; Transfer     4     2     3     5     3     3       12. Financial     1     1     1     1     1     1     1     1     1       13. Financial cost     13.1 Total undiscounted cost     3     2     3     3     3     3     3       13. Enancial cost     13.1 Total undiscounted cost     3     2     3     3     3     3     3       13.2 Rate of spend compared to LTP     3     2     3     3     3     3     3     3       13.3 Stability of cost estimates     4     4     3     2     3     3     3     3       13.3 Stability of cost estimates     10     8     9	Group 6: Regulatory issues		Ā							I I WB disposal currently established process: decontamination_once policy for
12. Acceptability       12.1 Likelihood of gaining regulatory acceptance       4       2       3       5       3       3       implies planning requirements in addition to authorisation consideration         Totals       4       2       3       5       3       3       implies planning requirements in addition to authorisation consideration         Group 7: Financial       1       1       1       1       1       1       1         13. Financial cost       13.1 Total undiscounted cost       3       2       3       3       3       3       Costs.         13.2 Rate of spend compared to LTP       3       2       3       3       3       3       3       Significant accelerated spend.         13.3 Stability of cost estimates       4       4       3       2       3       3       3       significant fluctuations.         13.3 Stability of cost estimates       4       4       3       2       3       3       significant fluctuations.         13.4       Total less Group 7 scores       128       115       102       127       105       109         13.4       Total less Group 7 scores       128       115       102       127       105       109         13.4       Total										demonstration of SoLA agreed regulatory framework in place; Transfer, thermal
Image: constraint of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second se	12. Acceptability		Ц							implies planning requirements in addition to authorisation considerations.
13. Financial cost     13.1 Total undiscounted cost     3     2     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3     3 <td></td> <td></td> <td>1</td> <td>7</td> <td>4</td> <td>5</td> <td>5</td> <td>5</td> <td>5</td> <td></td>			1	7	4	5	5	5	5	
13. Financial cost     13.1 Total undiscounted cost     3     2     3     3     3     3     costs.       13.2 Rate of spend compared to LTP     3     2     3     3     3     3     Rate of spend similar to baseline for all options with exception of on-sit significant accelerated spend.       13.3 Stability of cost estimates     4     4     3     2     3     3     Bate of spend similar to baseline for all options with exception of on-sit significant accelerated spend.       13.3 Stability of cost estimates     4     4     3     2     3     3     Bate of spend similar to baseline for all options with exception of on-sit significant accelerated spend.       13.3 Stability of cost estimates     4     4     3     2     3     3     Bate of spend similar to baseline for all options with exception of on-sit significant fluctuations.       13.3 Stability of cost estimates     4     4     3     2     3     3     Bate of spend similar to baseline for all options with exception of on-sit significant fluctuations.       13.3 Stability of cost estimates     4     4     3     2     3     3     Bate of spend similar to baseline for all options with exception of on-sit significant fluctuations.       13.4 Total undificant fluctuations     13     13     15     102     121     105     109       14     138     123	Group 7: Financial		日							
13.2 Rate of spend compared to LTP     3     2     3     3     3     3     significant accelerated spend.       13.2 Rate of spend compared to LTP     4     4     3     2     3     3     significant accelerated spend.       13.3 Stability of cost estimates     4     4     3     2     3     3     significant accelerated spend.       Decontamination and on-site disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are under site control; disposal are u	13. Financial cost	13.1 Total undiscounted cost	Ц	3	2	3	3	3	3	costs.
13.3 Stability of cost estimates     4     4     3     2     3     3     significant fluctuations.       Totals     10     8     9     8     9     9       3		13.2 Rate of spend compared to LTP	Ц	3	2	3	3	3	3	significant accelerated spend.
3         2         128         115         102         121         105         109           Overall Total         138         123         111         129         114         118			Ц							
Overall Total         138         123         111         129         114         118		Totals	3	10	8	9	8	9	9	
		Total less Group 7 scores	Н	128	115	102	121	105	109	1
		Overall Total	Н	138	123	111	129	114	118	1
		No. of 5s		4	5	0	1	0	0	1
No. of 0s         0         0         0         0         0         0		No. of 0s	H	0	0	0	0	0	0	1

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UNWEIGHTED			í ľ				· ·		
Group 1: Human health and safety	1	7	30	30	26	27	25	26	
Group 2: Environmental impact	1	8	31	30	26	29	24	27	
Group 3: Environmental objectives	1	7	27	22	18	21	23	22	
Group 4: Technical	1	8	30	25	23	33	24	25	
Group 5: Socio-economic	1	2	6	6	6	6	6	6	
Group 6: Regulatory	1	1	4	2	3	5	3	3	
Group 7: Financial	1	3	10	8	9	8	9	9	
Overall unweighted total			138	123	111	129	114	118	
TEAM WEIGHT									
Group 1: Human health and safety	10	7	43	43	37	39	36	37	
Group 2: Environmental impact	10	8	39	38	33	37	30	34	
Group 3: Environmental objectives	5	7	19	16	13	15	16	16	
Group 4: Technical	8	8	30	25	23	33	24	25	
Group 5: Socio-economic	1	2	3	3	3	3	3	3	
Group 6: Regulatory	5	1	20	10	15	23	15	15	
Group 7: Financial	8	3	27	21	24	22	24	24	
Overall team weighted total			181	155	148	171	148	154	
TECHNOLOGY WEIGHT				1.0					
Group 1: Human health and safety	10	7	43	43	37	39	36	37	
Group 2: Environmental impact	1	8	4	4	3	4	3	3	
Group 3: Environmental objectives	1	7	4	3	3	3	3	3	
Group 4: Technical	10	8	38	31	29	41	30	31	
Group 5: Socio-economic Group 6: Regulatory	1 1	2	3 4	3 2	3 3	3 5	3 3	3 3	
Group 6: Regulatory Group 7: Financial	10	3	4 33	27	30	5 28	30	30	
•	10	3	128	113	108	20 121	108	30 111	
Overall technology weighted total			120	113	108	121	IUÖ	111	
ENVIRONMENTAL WEIGHT				-					
Group 1: Human health and safety	10	7	43	43	37	39	36	37	
Group 2: Environmental impact	10	8	39	38	33	37	30	34	
Group 3: Environmental objectives	10	7	39	31	26	30	33	31	
Group 4: Technical	1	8	4	3	3	4	3	3	
Group 5: Socio-economic	1	2	3	3	3	3	3	3	
Group 6: Regulatory	1	1	4	2	3	5	3	3	
Group 7: Financial	1	3	3	3	3	3	3	3	
Overall environmental weighted total			134	122	107	120	111	114	
FINANCIAL WEIGHT									
Group 1: Human health and safety	1	7	4	4	4	4	4	4	
Group 2: Environmental impact	1	8	4	4	3	4	3	3	
Group 3: Environmental objectives	1	7	4	3	3	3	3	3	
Group 4: Technical	1	8	4	3	3	4	3	3	
Group 5: Socio-economic	1	2	3	3	3	3	3	3	
Group 6: Regulatory	1	1	4	2	3	5	3	3	
Group 7: Financial	10	3	33	27	30	28	30	30	
Overall financial weighted total			56	46	48	50	49	49	

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Attributes	Sub-attributes	٩N	/ 🎖	1 40	/ ర్ శె	0	/ 0	Scoring Notes
Group 1: Human health and	d safety	-						
1. Public H&S individuals	1.1 Routine radiation doses		4	3	4	4	4	
	1.2 Rad accident risks	1	3	3	3	3	2	
		ľ						Decontamination and disposal at LLWR near Drigg highest scoring due
	1.3 Non-rad hazards and risks		4	3	3	3	4	to limited off-site transportation.
2. Public H&S collective	2.1 Routine radiation doses		4	3	4	3	3	
<ol><li>Worker H&amp;S individuals</li></ol>	3.1 Routine radiation doses 3.2 Rad accident risks	-	3	3	3	3	3	
	3.3 Non-rad hazards and risks	1	3	3	3	3	3	
	Totals		24	20	24	22	22	
		7						
Group 2: Environmental im	pact	_						Deleted to since lite entries (non-terms at (secolds areas as ))
								Related to air quality arising from transport (on-site max score);
4. Physical environment	4.1 Air quality	1	3	3	4	3	3	incineration modified to be consistent with other options - abatement systems would be in place.
	4.2 Water quality	$\vdash$	3	3	4	4	3	oyacine would be in pideo.
	4.3 Land quality	Ĺ	3	3	3	3	3	All involve disposal or significant site - no differentiation.
		Γ						Incineration modified - large building but not necessarily on-site -
	4.4 Visual impact	L	3	2	2	4	2	equivalent to on-site disposal and disposal at LLWR near Drigg.
	4.5 Nuisance	L	5	2	3	3	2	Incidentian is operaty intensive: other dispessive entities security and for
	4.6 Use of natural resources	1	4	2	2	2	2	Incineration is energy intensive; other disposal options requirements for aggregate and building materials
	4.6 Use of natural resources 4.7 Transport	┢	4	3	5	3	3	aggregate and building materials.
5. Flora and fauna	5.1 Preservation of ecosystems	1	3	3	2	4	3	
	Totals		28	21	25	26	21	
		8						
Group 3: Environmental ob 6. Environmental objectives		-	2	-	1	2	2	
6. Environmental objectives	6.2 Waste hierarchy	-	3 5	5 4	1 2	2	1	
	6.3 Hazard reduction	-	5	3	2	2	2	
	6.4 Concentrate and contain		3	3	3	1	3	
	6.5 Generation of secondary wastes		2	2	5	3	4	
								Relative scoring reflects - incineration energy intensive processes;
								Disposal at LLWR near Drigg and decontamination less energy
	6.6 Greenhouse gas emissions 6.7 Proximity principle	-	3	2	4 5	4	3	intensive but more so than on-site disposal and vLLW.
	Totals	-	25	22	22	17	18	
		7						
Group 4: Technical								
7. Viability	7.1 Maturity of technology	-	3	4	2	2	4	Consistent with scoring for metals - score for on-site disposal reflects
	7.2 Continued availability of option		3	3	3	3	4	fact that the facility does not yet exist.
	7.2 Continued availability of option	1	v	Ŭ	Ŭ	Ŭ	-	
								vLLW facility does not exist but would be designed appropriately but
	7.3 Throughput/capacity of option		3	3	4	2	3	under control of third party; on-site capacity would be under site control.
8. Nuclear Safety	8.1 Likelihood of meeting CFA		3	3	4	2	4	On-site score similar to metals - more likely than vLLW
10. Programme	10.1 Scheduling variance compared to LTP	L	3 2	3	3	2	3	
	10.2 Minimising project risk to NDA 10.3 Discharge of NDA liabilities	┢	3	3	3	2	3 4	1
	10.4 Consistency with site End State	1	4	4	2	3	4	
	Totals		26	27	23	19	29	
		8						
		Γ						
Group 5: Socio-economic	11 1 Formania immed	<u> </u>	<u> </u>	-	-	-	-	No. changes
11. Local community	11.1 Economic impacts 11.2 Culture and heritage	┢	3	3	3	3	3	No change No change
	Totals	┢	6	6	6	3 6	3 6	
		2	-	Ť	Ť	Ť	Ť	
Group 6: Regulatory issues	3	Ē						
12. Acceptability	12.1 Likelihood of gaining regulatory acceptar		3	2	2	3	4	
	Totals	Ĺ	3	2	2	3	4	
		1			ļ			
Group 7: Financial		┢				<u> </u>		1
o.oup /.i mullolai		$\vdash$		<u> </u>	ł –	1		Disposal at LLWR near Drigg - baseline; on-site more expensive
13. Financial cost	13.1 Total undiscounted cost	1	3	3	2	3	3	(construction costs) - other options similar.
	13.2 Rate of spend compared to LTP		3	3	2	3	3	On-site disposal requires accelerated expenditure
		1				_		Decontamination and on-site disposal are more under site control and
	13.3 Stability of cost estimates	1	4	•	4	3	2	less uncertain than other options; incineration depends on third party, but is less uncertain than LLWR disposal costs.
	13.3 SIADIIIIV OF COSL ESTIMATES	┝	4	3 9	4	3	2 8	out is less uncertain than LLWH disposal costs.
			10	3		3	0	
	Totals	3						
		3						1
		3	112	98	102	93	100	
	Totals Total less Group 7 scores	3						
	Totals	3	112 122	98 107	102 110	93 102	100 108	
	Totals Total less Group 7 scores Overall Total	3	122		110	102	108	
	Totals Total less Group 7 scores	3						

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UNWEIGHTED								
Group 1: Human health and safety	1	7	24	20	24	22	22	
Group 2: Environmental impact	1	8	28	21	25	26	21	
Group 3: Environmental objectives	1	7	25	22	22	17	18	
Group 4: Technical Group 5: Socio-economic	1 1	8	26 6	27 6	23 6	19 6	29 6	
Group 5: Socio-economic Group 6: Regulatory	1	2	6 3	6 2	6 2	<u> </u>	ь 4	
Group 7: Financial	1	3	10	2	2	9	4 8	
Overall unweighted total		0	122	9 107	。 110	9 102	0 108	
TEAM WEIGHT								
Group 1: Human health and safety	10	7	34	29	34	31	31	
Group 2: Environmental impact	10	8	35	26	31	33	26	
Group 3: Environmental objectives	5	7	18	16	16	12	13	
Group 4: Technical	8	8	26	27	23	19	29	
Group 5: Socio-economic	1	2	3	3	3	3	3	
Group 6: Regulatory	5	1	15	10	10	15	20	
Group 7: Financial	8	3	27	24	21	24	21	
Overall team weighted total			158	135	139	137	144	
TECHNOLOGY WEIGHT								
Group 1: Human health and safety	10	7	34	29	34	31	31	
Group 2: Environmental impact	1	8	4	3	3	3	3	
Group 3: Environmental objectives	1	7	4	3	3	2	3	
Group 4: Technical	10	8	33	34	29	24	36	
Group 5: Socio-economic Group 6: Regulatory	1		3		3	3	3	
		2		3		S	٨	
	1	1	3	2	2	3	4	
Group 7: Financial			3 33	2 30	2 27	30	27	
j j	1	1	3	2	2	-	-	
Group 7: Financial	1	1	3 33	2 30	2 27	30	27	
Group 7: Financial	1	1	3 33	2 30	2 27	30	27	
Group 7: Financial Overall technology weighted total	1	1	3 33	2 30	2 27	30	27	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact	1 10	1 3	3 33 <b>113</b>	2 30 <b>103</b>	2 27 <b>101</b>	30 97	27 107	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives	1 10 10	1 3 7 8 7	3 33 <b>113</b> 34 35 36	2 30 <b>103</b> 29 26 31	2 27 <b>101</b> 34 31 31	30 97 31	27 <b>107</b> 31	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical	1 10 10 10 10 10 1	1 3 7 8 7 8	3 33 <b>113</b> 34 35 36 3	2 30 103 29 26 31 3	2 27 <b>101</b> 34 31 31 31 3	30 97 31 33 24 2	27 <b>107</b> 31 26 26 4	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic	1 10 10 10 10 1 1 1	1 3 7 8 7 8 2	3 33 <b>113</b> 34 35 36 3 3 3	2 30 <b>103</b> 29 26 31 3 3	2 27 <b>101</b> 34 31 31 31 3 3	30 97 31 33 24 2 3	27 <b>107</b> 31 26 26 4 3	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory	1 10 10 10 10 1 1 1 1 1	1 3 7 8 7 8 2 1	3 33 113 34 35 36 3 3 3 3 3	2 30 <b>103</b> 29 26 31 3 3 3 2	2 27 101 34 31 31 3 3 2	30 97 31 33 24 2 3 3 3	27 <b>107</b> 31 26 26 4 3 4	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial	1 10 10 10 10 1 1 1	1 3 7 8 7 8 2	3 33 <b>113</b> 34 35 36 3 3 3 3 3 3 3	2 30 <b>103</b> 29 26 31 3 3 2 3	2 27 101 34 31 31 3 3 2 3	30 97 31 33 24 2 3 3 3 3	27 <b>107</b> 31 26 26 4 3 4 3	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory	1 10 10 10 10 1 1 1 1 1	1 3 7 8 7 8 2 1	3 33 113 34 35 36 3 3 3 3 3	2 30 <b>103</b> 29 26 31 3 3 3 2	2 27 101 34 31 31 3 3 2	30 97 31 33 24 2 3 3 3	27 <b>107</b> 31 26 26 4 3 4	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial	1 10 10 10 10 1 1 1 1 1	1 3 7 8 7 8 2 1	3 33 <b>113</b> 34 35 36 3 3 3 3 3 3 3	2 30 <b>103</b> 29 26 31 3 3 2 3	2 27 101 34 31 31 3 3 2 3	30 97 31 33 24 2 3 3 3 3	27 <b>107</b> 31 26 26 4 3 4 3	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 5: Socio-economic Group 6: Regulatory Group 7: Financial Overall environmental weighted total	1 10 10 10 10 10 1 1 1 1 1	1 3 7 8 7 8 2 1	3 33 <b>113</b> 34 35 36 3 3 3 3 3 3 3	2 30 <b>103</b> 29 26 31 3 3 2 3	2 27 101 34 31 31 3 3 2 3	30 97 31 33 24 2 3 3 3 3	27 <b>107</b> 31 26 26 4 3 4 3	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 5: Socio-economic Group 6: Regulatory Group 7: Financial Overall environmental weighted total FINANCIAL WEIGHT	1 10 10 10 10 10 1 1 1 1 1	1 3 7 8 7 8 2 1	3 33 <b>113</b> 34 35 36 3 3 3 3 3 3 3	2 30 <b>103</b> 29 26 31 3 3 2 3	2 27 101 34 31 31 3 3 2 3	30 97 31 33 24 2 3 3 3 3	27 <b>107</b> 31 26 26 4 3 4 3	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 5: Socio-economic Group 6: Regulatory Group 7: Financial Overall environmental weighted total	1 10 10 10 10 10 1 1 1 1 1	1 3 7 8 7 8 2 1 3	3 33 113 34 35 36 3 3 3 3 3 3 3 118	2 30 <b>103</b> 29 26 31 3 3 2 3 <b>98</b>	2 27 101 34 31 31 3 3 2 3 3 108	30 97 31 33 24 2 3 3 3 3 100	27 107 31 26 26 4 3 4 3 97	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 5: Socio-economic Group 6: Regulatory Group 7: Financial Overall environmental weighted total FINANCIAL WEIGHT Group 1: Human health and safety	1 10 10 10 10 10 1 1 1 1 1 1 1 1 1 1	1 3 7 8 7 8 2 1 3 3 7	3 33 113 34 35 36 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 30 <b>103</b> 29 26 31 3 3 2 3 <b>98</b> <b>98</b>	2 27 101 34 31 31 3 3 2 3 3 108 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	30 97 31 33 24 2 3 3 3 3 100 3	27 107 31 26 26 4 3 3 97 97 3	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 5: Socio-economic Group 6: Regulatory Group 7: Financial Overall environmental weighted total FINANCIAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact	1 10 10 10 10 10 1 1 1 1 1 1 1 1 1 1 1	1 3 7 8 7 8 2 1 3 3 7 7 8 8	3 33 113 34 35 36 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 30 103 29 26 31 3 3 2 3 98 98 98 3 3 3 3 3 3 3 3 3 3	2 27 101 34 31 31 3 3 3 2 3 3 108 108 3 3 3 3 3	30 97 31 33 24 2 3 3 3 3 100 3 3 3 3 3	27 107 31 26 26 4 3 3 97 97 3 3 3	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial Overall environmental weighted total FINANCIAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 4: Technical Group 5: Socio-economic	1 10 10 10 10 10 1 1 1 1 1 1 1 1 1 1	1 3 7 8 7 8 2 1 3 3 7 7 8 7	3 33 113 34 35 36 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 4 4 3 3 3	2 30 103 29 26 31 3 3 2 3 98 98 98 3 3 3 3 3 3 3 3	2 27 101 34 31 3 3 3 2 3 3 2 3 3 108 108 3 3 3 3 3 3 3 3	30 97 31 33 24 2 3 3 3 3 100 3 3 3 2	27 107 31 26 26 4 3 3 97 97 3 3 3 3 3	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial Overall environmental weighted total FINANCIAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 5: Socio-economic	1 10 10 10 10 10 1 1 1 1 1 1 1 1 1 1 1	1 3 7 8 7 8 2 1 3 3 7 7 8 7 8 7 8 7 8 2 1	3 33 113 34 35 36 3 3 3 3 3 3 3 3 3 3 3 4 4 4 3 3 3 3	2 30 <b>103</b> 29 26 31 3 3 2 3 <b>98</b> <b>98</b> <b>98</b> 3 3 3 3 3 3 3 3 2 2	2 27 101 34 31 31 3 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 2	30 97 31 33 24 2 3 3 3 3 100 3 3 2 2 2 3 3 3 3	27 107 31 26 26 4 3 3 4 3 3 3 3 3 3 4 3 3 4 3 4 3 4	
Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial Overall environmental weighted total FINANCIAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 4: Technical Group 5: Socio-economic	1 10 10 10 10 10 1 1 1 1 1 1 1 1 1 1 1	1 3 7 8 7 8 2 1 3 3 7 7 8 7 8 7 8 7 8 2	3 33 113 34 35 36 3 3 3 3 3 3 3 3 3 3 3 3 3 3 4 4 4 3 3 3	2 30 <b>103</b> 29 26 31 3 3 3 2 <b>98</b> <b>98</b> <b>98</b> 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2 27 101 34 31 31 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	30 97 31 33 24 2 3 3 3 3 100 3 3 3 2 2 2 3	27 107 31 26 26 4 3 3 97 97 3 3 3 3 3 3 4 3 3	

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Attributes	Sub-attributes	۶	/ *	Discher Charles	Scoring Notes
Group 1: Human health and	l safety				
· · ·		$\square$			Discharge greater potential for public doses - difference reflects
1. Public H&S individuals	1.1 Routine radiation doses		5	4	differentiation rather than magnitudes of impact.
	1.2 Rad accident risks	++	4	4	
	1.3 Non-rad hazards and risks	+	5	5	No off-site hazard foreseen.
l		+	•	, ,	
			_	_	Routine doses small proportion of dose limit therefore limited
	2.1 Routine radiation doses		5	5	potential for high collective dose.
	3.1 Routine radiation doses		3	4	Greater handling with treatment operations.
	3.2 Rad accident risks		3	4	Greater handling with treatment operations.
	3.3 Non-rad hazards and risks		4	4	No significant hazard.
1	Totals		29	30	
		7			
1		$\square$			
Group 2: Environmental im	pact	+			
	4.1 Air quality	+	5	5	
		+	4	3	
	4.2 Water quality	$\vdash$		-	Poflecte land take from new treatment and the barre about
	4.3 Land quality	$\vdash$	3	4	Reflects land take from new treatment and discharge plant.
	4.4 Visual impact	$\square$	4	4	No change in visual impact off-site.
	4.5 Nuisance	$\Box$	4	4	No significant impact.
	4.6 Use of natural resources		3	4	Treatment - greater use of natural resources for running facility.
	4.7 Transport		4	4	
5. Flora and fauna	5.1 Preservation of ecosystems	Н	4	4	Large volume into which discharged - insignificant impact.
	Totals	+	31	32	and the second goal more investigation of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second
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Group 3: Environmental ob			-		
<ol><li>Environmental objectives</li></ol>			3	3	
	6.2 Waste hierarchy		1	1	
1	6.3 Hazard reduction		4	1	Discharge with no treatment disperses the hazard.
	6.4 Concentrate and contain		4	1	Discharge with no treatment disperses the hazard.
					Treatment gives rise to wastes from abatement facility. Discharge in
1					absence of treatment - no significant production of such wastes.
1					Attribute primarily intended to reflect solid waste treatment
1	6.5. Concretion of accordary waster		2	5	processes. So scoring differs from other waste streams.
	6.5 Generation of secondary wastes	+			processes. So scoring unlers norn other waste streams.
	6.6 Greenhouse gas emissions	$\square$	4	4	
ļ!	6.7 Proximity principle		3	3	
	Totals	-	21	18	
		7			
Group 4: Technical					
7. Viability	7.1 Maturity of technology	$\square$	5	5	Available technology (has been employed on site in past).
· · · · · · · · · · · · · · · · · · ·	7.2 Continued availability of option	$\square$	3	5	Treatment requires additional treatment plant to be built on site.
	7.3 Throughput/capacity of option	+	3	4	
		+	, v		Treatment requires additional treatment plant to be built on site -
10 Drogramma	10.1 Cabaduling variance compared to LTD			-	
10. Programme	10.1 Scheduling variance compared to LTP	$\square$	4	5	possible within timeframe.
· · · ·					
		1 1			Development and operation of treatment plant would divert resources
	10.2 Minimising project risk to NDA		3	4	
	10.2 Minimising project risk to NDA 10.3 Discharge of NDA liabilities	$\parallel$	3 3	4 5	Development and operation of treatment plant would divert resources
					Development and operation of treatment plant would divert resources from elsewhere.
	10.3 Discharge of NDA liabilities		3	5	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State		3 5	555	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site.
	10.3 Discharge of NDA liabilities	-	3	5	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State	6	3 5	555	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State	-	3 5	555	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
Group 5: Socio-economic	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals	-	3 5 26	5 5 33	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts	-	3 5 26 3	5 5 33 33	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
Group 5: Socio-economic	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage	6	3 5 26 3 3	5 33 3 3 3	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
Group 5: Socio-economic	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts	6	3 5 26 3	5 5 33 33	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
Group 5: Socio-economic	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage	6	3 5 26 3 3	5 33 3 3 3	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
Group 5: Socio-economic	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage Totals	6	3 5 26 3 3	5 33 3 3 3	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to
Group 5: Socio-economic 11. Local community	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage Totals	6	3 5 26 3 3	5 33 3 3 3	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to provide full site-clearance.
Group 5: Socio-economic 11. Local community	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage Totals	6	3 5 26 3 3	5 33 3 3 3	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to provide full site-clearance.
Group 5: Socio-economic 11. Local community Group 6: Regulatory issues	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage Totals	6	3 5 26 3 3 6	5 33 3 3 6	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to provide full site-clearance.
Group 5: Socio-economic 11. Local community	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage Totals 12.1 Likelihood of gaining regulatory acceptance	6	3 5 26 3 3 6 4	5 33 3 3 6 4	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to provide full site-clearance.
Group 5: Socio-economic 11. Local community Group 6: Regulatory issues	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage Totals	6	3 5 26 3 3 6	5 33 3 3 6	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to provide full site-clearance.
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Group 5: Socio-economic 11. Local community Group 6: Regulatory issues 12. Acceptability	10.3 Discharge of NDA liabilities 10.4 Consistency with site End State Totals 10.4 Consistency with site End State Totals 11.1 Economic impacts 11.2 Culture and heritage Totals 12.1 Likelihood of gaining regulatory acceptance	6	3 5 26 3 3 6 4	5 33 3 3 6 4	Development and operation of treatment plant would divert resources from elsewhere. Treatment results in residue and additional plant remaining on-site. Treatment plant would be temporary and could be removed to provide full site-clearance.
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Group 1: Human health and safety	1	7	29	30	
Group 2: Environmental impact	1	8	31	32	
Group 3: Environmental objectives	1	7	21	18	
Group 4: Technical	1	6	26	33	
Group 5: Socio-economic	1	2	6	6	
Group 6: Regulatory	1	1	4	4	
Group 7: Financial	1	3	7	9	
Overall unweighted total			124	132	
TEAM WEIGHT					
Group 1: Human health and safety	10	7	41	43	
Group 2: Environmental impact	10	8	39	40	
Group 3: Environmental objectives	5	7	15	13	
Group 4: Technical	8	6	35	44	
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	5	1	20	20	
Group 7: Financial	8	3	19	24	
Overall team weighted total			172	187	
TECHNOLOGY WEIGHT					
Group 1: Human health and safety	10	7	41	43	
Group 2: Environmental impact	1	8	4	4	
Group 3: Environmental objectives	1	7	3	3	
Group 4: Technical	10	6	43	55	
Group 5: Socio-economic	1	2	3	3	
Group 6: Regulatory	1	2 1	3 4	3 4	
Group 6: Regulatory Group 7: Financial		2	3 4 23	3 4 30	
Group 6: Regulatory	1	2 1	3 4	3 4	
Group 6: Regulatory Group 7: Financial	1	2 1	3 4 23	3 4 30	
Group 6: Regulatory Group 7: Financial	1	2 1	3 4 23	3 4 30	
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Group 6: Regulatory Group 7: Financial Overall technology weighted total ENVIRONMENTAL WEIGHT Group 1: Human health and safety Group 2: Environmental impact Group 3: Environmental objectives Group 4: Technical Group 5: Socio-economic Group 6: Regulatory Group 7: Financial	1 10 10 10 10 1 1 1 1 1	2 1 3 7 8 7 6 2 1	3 4 23 <b>122</b> 41 39 30 4 3 3 4 2	3 4 30 141 43 40 26 6 3 4 3	
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# APPENDIX F. BRIEFING MATERIALS FOR OPTIONEERING WORKSHOP



# **Chapelcross site-wide BPEO study**

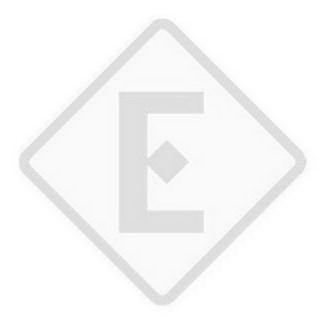
Briefing materials for optioneering workshop

February 2007

Briefing materials for optioneering workshop

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## 1. Introduction

Chapelcross Power Station ceased generation in 2004. Defuelling is underway and planned for completion by April 2009.

Initial decommissioning of the site is being undertaken in parallel with the defuelling. Redundant plant and buildings are being removed or made safe, and waste materials are disposed of or will be placed in a safe condition and location for interim storage.

This initial work will prepare the site for 'Care and Maintenance' where the reactor block and remaining wastes will be left in a safe state pending final site clearance. This work is planned to be completed in 2021.

Scottish Environment Protection Agency (SEPA) wishes to issue a revised multi-media discharge authorisation under the Radioactive Substances Act to reflect both the change in focus of site operations and an update to the issuing of discharge authorisations under the Radioactive Substances Act. As part of the authorisation revision British Nuclear Group anticipate that SEPA will require justification that the plans for the management of the wastes represent the Best Practicable Environmental Option (BPEO).

This workshop marks an initial phase of such supporting studies.

### 2. BPEO

The BPEO concept has been developed in the United Kingdom as a result of the work of the Royal Commission on Environmental Pollution (RCEP) who defined BPEO as follows in its Twelfth Report:

"... the outcome of a systematic and consultative decision-making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long term as well as in the short term."

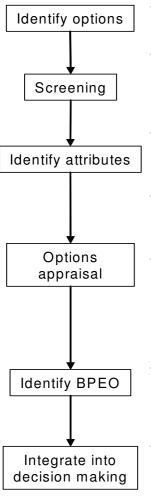
A BPEO study is a particular example of the more general process of options appraisal. An options appraisal is an appraisal carried out by any person or organisation of a range of possible options for achieving a specified objective. A BPEO study is a particular form of options appraisal in which, given that waste creation has already been minimised, the waste disposal option is sought that achieves the minimum impact on the environment of the waste that is nevertheless

BPEO studies have the following attributes:

- The process is essentially strategic it is geared towards identifying a preferred overall strategy from the perspective of the environment as a whole, as opposed to detailed optimisation of the selected scheme.
- A structured and systematic process is used to identify and compare strategic options. The presumption is that a BPEO study will generally be an open and transparent process, documented to make explicit the reasoning, data and assumptions.
- Alternatives are evaluated in terms of their projected implications for environmental quality. Consideration also needs to be given to questions of practicability (including financial costs and/or benefits, as well as wider social and economic considerations), as well as the overall strategic objectives, in order to reflect the wider context in which the decision is being taken.
- The process should involve consideration of environmental effects in both the short term and the long term, requiring consideration to be given to the relative importance of different indicators of environmental performance (e.g. short-lived versus persistent pollutants).

- Effects on the environment are not necessarily restricted to direct emissions of pollutants to land, air and water from the process (or activity) itself; life cycle considerations (such as energy demand) may also have a part to play in the decision process.
- There is an accent on consultation as an integral part of the study process an informed study of alternatives necessarily involves taking into account the values and perspectives of a range of stakeholders.

The general methodology for BPEO studies follows a step wise appraisal of alternatives. The steps are:



- **Identification of options -** A broad list of options is drawn up and characterised in sufficient depth for initial screening.
- **Screening** Decisions are made regarding the principles to be applied in deciding the criteria for screening out options from further consideration, and then the criteria themselves are defined. The criteria are applied in order to select a short list of options from the initial broad list of alternatives.
  - **Selection of attributes -** The principles to be applied in deciding the attributes against which options are to be compared need to be decided, and then the attributes themselves.
- **Options analysis** Each option on the short list is evaluated against each attribute. The results of the evaluation are recorded either as a ranking (e.g. best to worst) or a numerical 'score'.
- Weighting factors Weightings may be applied to each attribute to reflect its relative importance in establishing a preferred option. If used as part of the analysis, weightings need to be systematically derived and justified. Alternative weighting sets can be used to test the sensitivity of the conclusions to different perceptions of relative importance (e.g. in order to reflect the perspectives of different stakeholder groups).
- **Identification of the BPEO** A 'logic flowchart' based on the results of option analysis and application of weighting factors identifies the BPEO. If a numerical scoring system is used, the top scoring option may be the starting point, but the conclusion may still be that this is not the BPEO.
- Integration into decision making Identification of the BPEO is an important input to strategic decision making. In practice, however, few decisions are made solely on the basis of such a study. The selection and approval of a preferred option may be modified by other factors that are not taken directly into account in the BPEO study. These other factors may include political considerations or the results of more detailed safety, economic and technical optimisation studies.

Stakeholder participation in the BPEO process is important because of:

- The technical and societal significance of the decision.
- The information that stakeholders can bring to the process.
- The extent to which sensitivity analysis to examine the effect of different perspectives is to be included.
- The extent to which stakeholder 'ownership' of the process is an objective.

Stakeholder involvement and consultation requirements should be identified and the objectives defined at an early stage in the process. The environment agencies' BPEO guidance emphasises that as an important part of a BPEO exercise 'the format for stakeholder interaction within the

#### Briefing materials for optioneering workshop

BPEO study should be designed to emphasise collaborative working'. Furthermore, the Guidance continues that 'it is generally more effective to obtain and use stakeholder input when communication has started early in the process'.

Whilst stakeholder input and views are not a basis in themselves for selecting the BPEO, they provide information and insight to support the decision making process.

For the BPEO study to be robust, and to ensure it gains the confidence of the regulators and wider stakeholder groups, the study should address a number of principal issues in the following ways:

- it must demonstrate that it is founded on a thorough understanding of current UK and international best practice in waste management and of likely future technological developments, as well as the overlapping health and safety, and environmental regulations that apply to the management of radioactive and non-radioactive wastes on a nuclear licensed site;
- that it takes account of recent and relevant experience in options studies as applied to the development of complex and optimised strategies for the management of multiple wastestreams, as well as the appropriate guidance on the subject; and
- shows a full appreciation of the role and expectations of various stakeholders in the BPEO process, how BPEO fits within a wider context of making a business case and informing the site Integrated Waste Strategy, and the need to ensure the entire process is transparent and auditable.

### 3. Chapelcross Decommissioning waste streams

The waste groups to be considered within the study are those arising from Care and Maintenance preparations:

- Intermediate Level Waste (ILW)<sup>1</sup> but also including that generated during the operational lifetime of the reactors
- Low Level Waste (LLW)<sup>2</sup>

### 4. Constraints on waste management

The management of wastes on a nuclear licensed site must conform to the appropriate health and safety, and environmental regulations, and to the conditions of the permits granted by the regulators. The primary legislative instruments that control the management of radioactive and non-radioactive waste respectively are the Nuclear Installations Act 1965 (NIA'65), the Radioactive Substances Act 1993 (RSA'93) and the Environmental Protection Act 1990 (EPA'90) with its associated regulations.

A key consideration in the management of waste at Chapelcross is the determination of which regulations apply to each wastestream and treatment.

### 4.1.1 Radioactive wastes

There are 2 standard licence conditions under NIA'65 that affect the management of radioactive wastes and which will need to be considered:

 Licence Condition 32: Accumulation of radioactive waste. The purpose of this licence condition is to ensure that the production rate and accumulation of radioactive waste on the site is minimised, held under suitable storage arrangements, and that adequate records are made.

<sup>&</sup>lt;sup>1</sup> Waste with radioactivity levels which exceed the upper boundary for low-level waste, but which does not generate significant amounts of heat.

<sup>&</sup>lt;sup>2</sup> Waste which contains radioactive materials which do not exceed 4 GBq/tonne alpha or 12 GBq/tonne beta/gamma activity.

#### Briefing materials for optioneering workshop

Licence Condition 33: Disposal of radioactive waste. The purpose of this licence condition is to give discretionary powers to NII in order to direct that radioactive waste is disposed of in a specified manner. This is related to the similar powers available to the environment agencies under RSA'93. Such disposals will need to be in accordance with the authorisations granted under RSA'93.

The management of all waste arising on a nuclear site will also be subject to the requirements of RSA'93 unless it can be demonstrated to the satisfaction of the regulators that the wastes are radioactively clean or excluded from the Act. In general wastes which do not fall under the scope of RSA'93 will fall under the scope of EPA'90.

Additionally, some forms of radioactive waste may be released from certain requirements of RSA'93 such as wastes subject to Exemption Orders. The key exemption order to be recognised in the BPEO process at Chapelcross is the Radioactive Substances (Substances of Low Activity) Exemption Order 1986 (as amended), known as the SoLA Exemption Order. The appropriate use of SoLA exemption is a primary tool in decommissioning waste management to avoid sentencing some forms of very lightly contaminated or activated wastes to the LLW disposal facility at Drigg, where disposal space is limited and disposal costs are high. The industry has published a 'Code of Practice on Clearance and Exemption' that sets out guidance on how this may be best achieved. The Radioactive Substances (Phosphatic and Rare Earths etc.) Exemption Order 1962, known as the PSRE Exemption Order may also apply to certain wastestreams at Chapelcross containing only naturally occurring radionuclides.

RSA'93 sets out the regime which controls the keeping and use of radioactive materials, and the accumulation and disposal of radioactive waste. Sections 13 and 14 of RSA'93 require the disposal and accumulation of radioactive waste to be carried out in accordance with an Authorisation granted by the competent authorities which, for Chapelcross, is SEPA. The requirement for British Nuclear Group to undertake a BPEO of its decommissioning wastes will be exercised under this Act.

Any option that is adopted must meet the appropriate regulatory controls, and both BPEO and BPM must be applied to ensure that radioactive wastes are not generated unnecessarily and that those arisings that do occur are either reused or recycled in preference to being disposed. Although BPM and optimisation issues are outside of the scope of this study, they must still be borne in mind given the costs of abating discharges from certain types of waste conditioning and processing plants which, in some circumstances, may not be proportional to the benefits they offer. There are complexities around demonstrating proportionality (cost benefit) in both BPEO and BPM and guidance exists for SEPA on this topic.

#### 4.1.2 Non-radioactive wastes

EPA'90 defines and contains provisions for controls on *controlled waste* under Part II, notably Section 33 (Prohibition of unauthorised treatment or disposal) and Section 34 (Duty of care). The Act prohibits the unlicensed management or disposal of waste and requires that a waste management licensing system is established.

Various regulations under EPA'90 will apply to the management and disposal of wastes arising on the Chapelcross site. Which set of regulations apply depends, in part, on the physical and chemical properties of the waste, its potential for causing harm to the environment, and the manner in which the waste is planned to be disposed. The relevant regulations are:

- Waste Management Licensing Regulations 1994 (WML Regulations) which sets-out the waste management licensing regime and related provisions required under EPA'90.
- Controlled Waste Regulations 1992 which define in more detail the categories of controlled waste
- Waste Management Regulations 1994 which make amendments of a mainly administrative nature to other regulations

- The Landfill (England and Wales) Regulations 2002 which implement the EU Landfill Directive 1999 and set out the requirements for the classification and management of landfill sites
- The Hazardous Waste (England and Wales) Regulations 2005 which detail requirements covering the production, movement, receipt and disposal of hazardous waste and replace the Special Waste Regulations 1996
- The EU Waste Oil Directive 1987 which aims to promote the safe collection and disposal of waste oils
- The Waste Electrical and Electronic Equipment Regulations 2006

Waste which is *exempt* under any of the Exemption Orders associated with RSA'93 remains radioactive for the purposes of regulation provided that it is not excluded by Schedule 1 of RSA'93. Exempt waste is not, therefore, subject to the WML Regulations but if its properties make it a special waste (e.g. radioactively contaminated asbestos) then it is subject to the Hazardous Waste Regulations. It is good industry practice to treat exempt waste which is not hazardous waste as if it were controlled waste, although this is not mandatory under legislation

Waste which is *clean* or *excluded* is not radioactive for the purposes of regulation and is subject to control as a controlled or special waste according to its other properties and is subject to the WML Regulations. The WML Regulations define a waste as either:

- discarded, disposed or got rid of by the holder, or
- intended to be discarded, disposed or got rid of by the holder, or
- required to be discarded, disposed or got rid of by the holder.

Schedule 3 of the WML Regulations lists a number of activities which are exempt from waste management licensing, and two of these may be applicable to waste management at Chapelcross and will need to be considered within the context of the site waste BPEO:

- land reclamation the spreading of waste consisting of soil, rock, ash or waste arising from construction or demolition work may be deposited on land in connection with the reclamation or improvement of that land subject to certain conditions; and
- *reuse and recycling* for the manufacture of specified materials from specified wastes, all of which are related to construction.

To determine a comprehensive BPEO which covers all wastestreams on the Chapelcross site, clear consideration is needed of the chemical and physical properties, including whether the waste is radioactive or hazardous. This initial consideration lays the foundation for the identification of options for each of the waste streams. For example certain properties of the waste may constrain the options available and consideration of the waste streams at an early stage in the BPEO should aim to exclude options which are clearly inappropriate. Consideration of the properties of the waste also feeds into the development of the screening criteria as it informs decisions about which legislation or policies are relevant and the constraints they impose.

### 5. Optioneering workshops

These first set of optioneering workshops would be intended to:

- confirm the materials assigned to each waste group
- draw-up a long-list of management options for each wastestream;
- draw-up a list of screening criteria;

- undertake a screening exercise to draw-up a short-list of options for more detailed assessment in the second round of assessments;
- draw-up an initial list of assessment criteria (attributes); and
- identify the information needs to enable the detailed assessment to be undertaken.

Each workshop will ensure that the initial long-list of management options is comprehensive, so as to meet the expectations of the regulators. Then the workshop will progress to consider screening so as to define a short-list of options that could be applied to each group of wastes. Screening will be based on fundamental yes/no decisions and should not, therefore, be subjective. A typical example of a screening criterion is consistency with UK law.

Once the waste groupings and short lists of options for each group are defined, it will be necessary to draw-up a preliminary list of assessment criteria (attributes) against which the performance of each option will be assessed. In parallel with these, consideration will need to be given to the information needs. As an example, a typical assessment criterion is capital cost and, therefore, an example of an information need is the construction cost of different types of waste treatment plant.

### 6. Subsequent work

Following these optioneering workshops the following tasks will be undertaken as part of the project

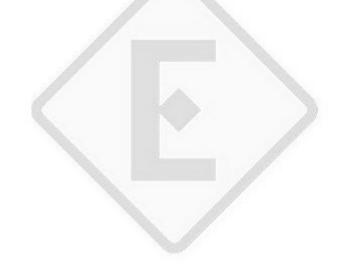
- Development of information for assessment workshops
- Convening of assessment workshops to score options
- Documentation of workshops

The anticipated end date for this project is 30<sup>th</sup> March 2007.

Waste material name	Current location	Total amount	Description
LLW	· · · · · · · · · · · · · · · · · · ·		· · · ·
Operational waste			
CXPP tritiated waste	CXPP	4 m <sup>3</sup>	Stored in alkathene containers in 205 I drums. Not suitable for super compaction as H-3 may be released
Reactor and associated areas LLW		74 m <sup>3</sup>	Stored in 205 l drums
Cooling ponds LLW		6.4 m <sup>3</sup>	Stored in 205 I drums
Large Items from Reactor Areas		892.0 m <sup>3</sup>	Wrapped and stored in HHISO
Large items from Cooling Ponds		15.6 m <sup>3</sup>	Wrapped and loose stored in HHISO
UO <sub>3</sub> contaminated LLW		16.0 m <sup>3</sup>	Stored in 205 I drums
Oils	Tank farm	164.5 m <sup>3</sup>	Stored in four mild steel tanks
Hydraulic fluids	B151	0.9 m <sup>3</sup>	Stored in stainless steel drums. Unsuitable for further treatments
C&M preps waste			
Reactor LLW		4370.6 m <sup>3</sup>	Not suitable for super compaction
Ponds LLW		2330.0 m <sup>3</sup>	Not suitable for super compaction
Active effluent pipeline concrete LLW		1335.0 m <sup>3</sup>	Not suitable for super compaction
Active effluent pipeline steel LLW		28.0 m <sup>3</sup>	Not suitable for super compaction
North site LLW		270.0 m <sup>3</sup>	Not suitable for super compaction
CXPP dismantling LLW		325.0 m <sup>3</sup>	Not suitable for super compaction
ILW			
Operational waste			
Miscellaneous Activated Components	Storage building	1.5 m <sup>3</sup>	Activated components comprising compacted ?liners? dry stored in stainless steel containers.
Miscellaneous Reactor Components	Cooling ponds	38.6 m <sup>3</sup>	Activated components comprising ??. Stored in skips.
Ion exchange resins	Fuel storage ponds	48.8 m <sup>3</sup>	Spent AW500 zeolite ion exchange resins
Sludges	Cooling ponds	8 m <sup>3</sup>	Stored in skips
CXPP ceramic pellets		9.7 m <sup>3</sup>	Dry stored in stainless steel cans in temporary storage vessels

**Optioneering Workshop – February 2007** 

Waste material name	Current location	Total amount	Description
Contaminated plant components	Storage building	3.6 m <sup>3</sup>	Stored in disposable flask liners.
Rotary Pump Oil	Storage building	0.25 m <sup>3</sup>	Stored in stainless steel cans
Miscellaneous $\beta\gamma$ waste	Storage building	25.3 m <sup>3</sup>	Stored in boxes
Skip decontamination sludge ponds R1 & R2	Ponds R1 & R2?	4 m <sup>3</sup>	
Fuel skips in ponds R1 & R2	Ponds R1 & R2?	200 m <sup>3</sup>	
Dessicant		4 m <sup>3</sup>	
C&M preps waste			
CXPP Dismantling ILW		237.0 m <sup>3</sup>	



### APPENDIX G. BRIEFING MATERIALS FOR ILW SCORING

### Scoring workshop – ILW briefing materials

#### **Objective:**

To score the potential management options for ILW identified within the study and to determine the BPEO.

#### Stages:

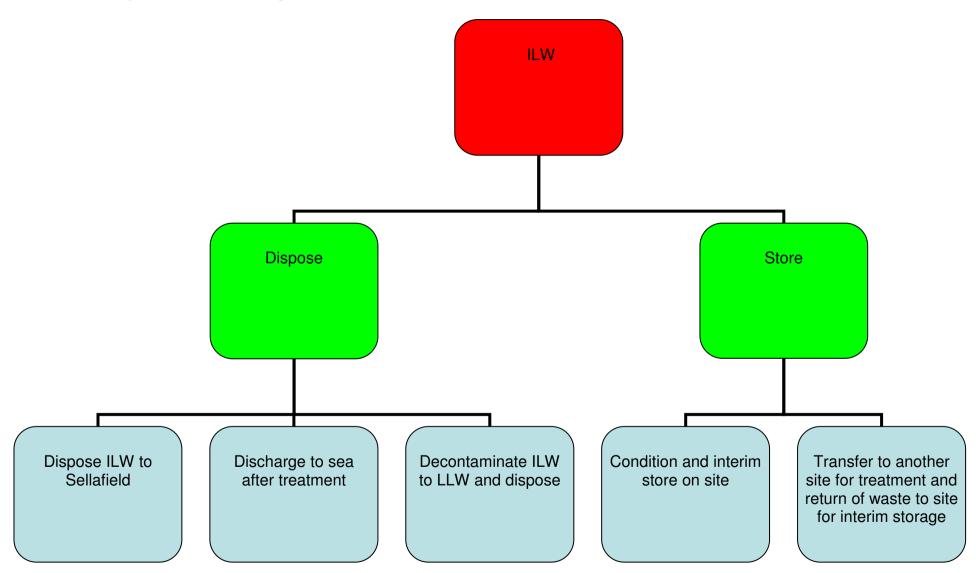
- 1. Review the options and their definitions
- 2. Review the screening criteria and then screen out any options that are not viable
- 3. Review the attributes and their calibration schemes
- 4. Score the options
- 5. Agree and apply weighting schemes
- 6. Determine the BPEO

Julie Tooley, Carol Robinson and Gavin Thomson Enviros Consulting 1 March 2007

Waste groupings for ILW To ensure the BPEO is comprehensive yet manageable certain ILW waste streams have been grouped.

	Segregatable	Metal	Ceramics	Magnox sludges	Sludges	Resins	Aggregate	Magnox	Magnox & Graphite	Dessicant	Oils & Oily wastes	Cellulose
	Se	Me	မီ	Ma slu	SIL	Re	Ag	Ма	Gra	De	Vai	မီ
Operational waste												
Miscellaneous Activated Components	~	~										
Miscellaneous Reactor Components	~	~							✓			~
Ion exchange resins	Х					✓						
Sludges	Х			✓								
CXPP ceramic pellets	Х		✓									
Contaminated plant components	~	~										~
Rotary Pump Oil	Х										<ul> <li>✓ (with vermiculite)</li> </ul>	
Misc BG waste		✓						✓			,	
Fuel skips in ponds 1 & 2	~	~										
Pond skip decontamination sludges					~							
Dessicant	Х									✓		
Spent furnaces	✓	✓										
Spent sources	Х											
C&M Preps												1
CXPP Dismantling ILW	$\checkmark$	$\checkmark$					$\checkmark$					

BPEO study for evaluation of decommissioning wastes at Chapelcross Scoring Workshops –March 2007 ILW



Flowchart for options for the management of ILW

BN0020023

#### Options for management of ILW

**Principles:** 

- All waste will be sorted and segregated and decontaminated then conditioned by some process
- Wastes with similar characteristics can be grouped

	Decontaminate ILW to LLW	Condition and interim store ILW	Treatment and discharge to sea	Transfer to another site	Dispose of ILW to Sellafield	No. of Options
Metal	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	4
Ceramics		$\checkmark$		$\checkmark$	$\checkmark$	3
Magnox sludges		$\checkmark$			$\checkmark$	2
Sludges		$\checkmark$			$\checkmark$	2
Aggregate	$\checkmark$	$\checkmark$				2
Resins		$\checkmark$		$\checkmark$		2
Magnox		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	4
Magnox and Graphite		$\checkmark$		$\checkmark$	$\checkmark$	3
Dessicant		$\checkmark$		$\checkmark$	$\checkmark$	3
Oily waste		$\checkmark$		$\checkmark$	$\checkmark$	3
Cellulosic		$\checkmark$		$\checkmark$	$\checkmark$	3

#### Description of options

#### **Dispose**

#### **Dispose ILW to Sellafield**

Waste would be packaged suitability and conditioned and then disposed by transfer to Sellafield where it is placed in the miscellaneous beta gamma waste store.

#### Discharge to sea after treatment

This option relates to the dissolution of Magnox Fuel Element Debris (FED) in carbonic acid followed by treatment to ensure compliance with the sites RSA93 authorisation then discharge to sea.

#### Decontaminate ILW to LLW and dispose to LLWR near Drigg

Decontamination of ILW using wet or dry techniques to remove loose or surface contamination resulting in waste complying with LLW activity limits and meeting CFA for the LLWR near Drigg.

#### <u>Store</u>

#### Condition and interim store on site

Waste would be conditioned to passive safety and stored in an interim store on site. This would require the granting of a LoC and the building of an interim store.

#### Transfer to another site for treatment and return of waste to site for interim storage

This option would involve transfer to another UK Nuclear Licensed Site where it would be conditioned to passive safety. The conditioned waste product would be returned to Chapelcross for interim storage. This would require the granting of a LoC and the building of an interim store.

#### Screening criteria

#### Derived from regulation

Criterion	Name	Description
1	London Convention	Disposal of solid radioactive waste at sea is suspended indefinitely.
2	OSPAR Convention	Waste producers are required to take all possible steps to reduce concentrations of natural radionuclides in the north eastern Atlantic to close to background, and close to zero for artificial radionuclides, by 2020.
3	Groundwater Regulations	The disposal of liquid wastes containing certain listed substances into groundwater is forbidden by the Groundwater Regulations.
4	Dose limits	The annual individual dose to members of the public must not exceed 1 mSv/yr. Doses to workers are limited to 20 mSv/yr averaged over five years (other limits also apply).

#### Derived from Government policy and guidance

5	Waste import and export	Radioactive waste may only be exported to (or imported from) elsewhere in small quantities and under special conditions.
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#### Attributes

Relevant attributes developed at the optioneering workshop

-attribute	Attribute group and attribute
	Human health and safety:
Routine radiation doses Radiological accident risks Non-radioactive hazards and risks	1. Public health and safety (individuals)
Routine radiation doses	2. Public health and safety (societal collective dose)
Routine radiation doses Radiological accident risks Non-radioactive hazards and risks	3. Worker health and safety (individuals)
	Environmental impact:
Air quality Water quality of receiving body Land Visual impact Nuisances (noise, light, dust, odour, vibration) Use of natural resources Transport	4. Physical environment
Preservation of ecosystems	5. Flora and fauna
Waste volumes Waste hierarchy Hazard reduction rate Concentrate and contain Generation of secondary wastes Greenhouse gas emissions Proximity principle	6. Environmental objectives
	Technical:

7. Viability	7.1 Maturity of technology
	7.2 Continued availability of option
	7.3 Throughput/capacity of option
8. Nuclear safety	8.1 Likelihood of meeting CfA
9. Flexibility	9.1 Foreclosing of options
10. Programme	10.1 Scheduling variance compared to LTP
	10.2 Minimising project risk to NDA
	10.3 Discharge of NDA liabilities
	10.4 Consistency with site end state
Socio-economic:	
11. Local community	11.1 Economic impacts
	11.2 Culture and heritage
Regulatory issues:	
12. Acceptability	12.1 Likelihood of gaining regulatory acceptance
Financial cost:	
13. Overall cost	13.1 Total undiscounted cost
	13.2 Rate of spend compared to LTP
	13.3 Stability of cost estimates
12. Acceptability Financial cost:	13.1 Total undiscounted cost 13.2 Rate of spend compared to LTP

### Scoring criteria

In the absence of appropriate data on the performance of some options, only the calibration of scores 0 and 5 has been provided. Scores 1 – 4 can be awarded on the basis of expert judgement on the relative performance of options against the 0 and 5 requirements, and relative performance between options.

Attribute/ sub-attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)	
1. Public health and safety (individuals)			
1.1 Routine radiation doses	Difficult to demonstrate doses <1 mSv y <sup>-1</sup> (Basic Safety Limit – BSL)	Easy to demonstrate doses <10 μSvyr <sup>-1</sup> ('below regulatory concern')	
1.2 Radiological accident consequences	Unacceptably high consequence	Low consequence	
1.3 Non-radioactive hazards and risks	Difficult to demonstrate risk <10 <sup>-4</sup> yr <sup>-1</sup>	Easy to demonstrate risk <10 <sup>-6</sup> yr <sup>-1</sup> ('below regulatory concern')	
2. Public health and safety (societal collect	ive dose		
2.1 Routine radiation doses	Difficult to demonstrate doses <100 person Sv	Easy to demonstrate doses <1 person Sv	
3. Worker health and safety (individuals)			
3.1 Routine radiation doses	Difficult to demonstrate doses <20 mSv y <sup>-1</sup> (Basic Safety Limit – BSL)	Easy to demonstrate doses <2 mSv y <sup>-1</sup> (Basic Safety Objective – BSO)	
3.2 Radiological accident consequences	Unacceptably high consequence	Low consequence	
3.3 Non-radioactive hazards and risks	Difficult to demonstrate risk <10 <sup>-3</sup> yr <sup>-1</sup> (largest tolerated risk where activity is crucial for society and economy)	Easy to demonstrate risk <10 <sup>-5</sup> yr <sup>-1</sup> (consistent with typical 'safe' practice in non nuclear industry)	
4. Physical environment			
4.1 Air quality	Persistent objectionable substances in air in buildings off site	No discernible reduction in air quality	
4.2 Water quality	Sterilisation of water resource off site or affects ability to reach site end-point	No discernible reduction in water quality	
4.3 Land quality	Sterilisation of substantial area of land off site or affects ability to reach site end-point	No discernible reduction in land quality	
4.4 Visual impact	Construction completely out of keeping with existing landscape	No discernible visual impact	

Attribute/ sub-attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)
4.5 Nuisances (noise, light etc)	Long-term disturbance/disruption of local life	No outward signs of the material management scheme
4.6 Use of natural resources	Unacceptably high use of resources and practice not sustainable	Limited use of resources and managed in a sustainable way
4.7 Transport	Unacceptably high increase in off site transport operations	No increase in off site transport operations
5. Flora and fauna		
5.1 Preservation of ecosystems	Complete loss of natural ecosystem	No discernible reduction in quality of the natural ecosystem
6. Environmental objectives		
6.1 Waste volume	Unacceptably high volumes of waste generated	Lowest volumes of waste generated
6.2 Waste hierarchy	Inconsistent with waste hierarchy and no material is reused or recycled, and there is no possibility that it ever can be	Consistent with waste hierarchy and all material is reused and none disposed
6.3 Hazard reduction	No reduction in hazard or hazard is increased over the long term	Hazards associated with the materials are reduced to a minimum, as rapidly as feasible
6.4 Concentrate and contain	Radioactivity is dispersed to the wider environment and no long remains under engineering or management control	Radioactivity is contained by passive engineered systems, and remains under management controls
6.5 Generation of secondary wastes	Large amounts of secondary waste produced far in excess of original waste volume	Limited secondary waste produced
6.6 Greenhouse gas emissions	Increase in greenhouse gas emissions	Reduction in greenhouse gas emissions [N.B. Score of 3 = no change]
6.7 Proximity principle	Waste management option undertaken at distant location	Waste management option undertaken on-site
7. Viability		·
7.1 Maturity of technology	Unproven and not achievable with existing technology in timescale of LCBL	Established approach, with good track record and applied under similar circumstances.
7.2 Continued availability of option	Not existing and could not be procured in timescale of LCBL	Existing and is available

Attribute/ sub-attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)		
7.3 Throughput/capacity of option	Throughput or capacity is very low and will adversely affect LTP	Throughput or capacity meets or exceeds demand and results in no impact on LTP		
8. Nuclear safety				
8.1 Likelihood of meeting Conditions for Acceptance	Significant dialogue required to meet Conditions for Acceptance	Conditions for Acceptance previously meet for similar wastestream		
9. Flexibility				
9.1 Foreclosing of options	Once implemented, no possibility for reversible steps or retrieval of material	Flexible option that allows for reversibility and easy retrieval of material		
10. Programme				
10.1 Scheduling variance compared to LTP	Would cause substantial delays to activities on site that lie on critical path, causing failure to meet LCBL objectives and timescales	Can be achieved independently of other activities on site and without impacting on the timing and ordering of other activities		
10.2 Minimising project risk to NDA	Significant project risk to NDA	No additional project risk to NDA		
10.3 Discharge of NDA liabilities	NDA liabilities increase in scale or in time	NDA liabilities significantly reduced in scale or period of liabilities significantly shortened		
10.4 Consistency with site end state	Completely inconsistent with defined site end state	Consistent with defined site end state		
11. Local community				
11.1 Economic impacts	Collapse of local economy	Major enhancement to the local economy [NB Score of 3 = no change]		
11.2 Culture and heritage	Collapse of local community through depopulation	Major enhancement of local community [NB Score of 3 = no change]		
12 Acceptability				
12.1 Likelihood of gaining regulatory acceptance	Significant dialogue required to gain approval	Demonstrable precedent exists		
13. Overall cost				
13.1 Total undiscounted cost	Significant undiscounted cost above LTP cost estimates	Undiscounted cost likely to remain within LTP cost estimates [NB Score of 3 = no change]		
13.2 Rate of spend compared to LTP	Significantly different to LTP cash flow forecast	Likely to remain within LTP cash flow forecast		

Attribute/ sub-attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)
		[NB Score of 3 = no change]
13.3 Stability of cost estimates	Cost estimates highly unstable	Cost estimates highly stable

#### Scoring

Score each of the 11 waste groups (Metal, Ceramics etc...) on separate Excel spreadsheets using the attributes and scoring schemes presented above. A master version for ILW is provided electronically, create one for each waste group using Save As noting that not all management options are relevant to all waste groups (an example for Metals is also provided).

Please return to <u>gavin.thomson@enviros.com</u> by close of play 9<sup>th</sup> March 2007.

## Weighting schemes

Weightings are usually applied to the total scores for each attribute group, and often normalised to take account of the number of sub-attributes in each group to avoid biasing those with the most sub-attributes.

Example: If the unweighted score for an option in the Technical attribute group is 25, the chosen weighting factor is 10, and there are 6 sub-attributes in the group, then the normalised weighted score for the group is  $(25 \times 10) / 6 = 41.7$  (to 1 decimal place)

The weighting schemes applied the Chapelcross wastes option study were.

Attribute group	Enviros Team Weighting	Technology position	Environmental position	Financial position
1. Human health	5	10	10	1
2. Environmental impact	5	1	10	1
3. Environmental objectives	5	1	10	1
4. Technical	5	10	1	1
5. Socio-economic	5	1	1	1
6. Stakeholder issues	1	1	10	1
7. Financial cost	1	10	1	10

## Determine the BPEO

The BPEO may be determined by comparing:

- the total unweighted scores for the options (which gives the highest score ?)
- the total unweighted scores, less costs, for the options (which gives the highest score without cost bias ?)
- the number of scores of 0 and 5 awarded to each option (which performs well across all attributes ?)
- the various total weighted scores for the options, and the sensitivity to the weighting factors (is the ranking robust to weighting ?)

#### Determining the preferred management strategy

The determination of a BPEO is only one factor that should be taken into account when choosing a management strategy, for example:

- An option that performs *better* environmentally than the BPEO could be adopted if there are other business factors to take into account (e.g. to protect or to foster the environmental reputation of the organisation – the 'Brent Spar' example).
- An option that performs *marginally worse* than the BPEO could be adopted if there is a large financial saving to be made and the environmental performance of the adopted option still meets appropriate constrains and conditions (the proportionality argument)

#### Waste material name Current location Total amount Description Operational waste $1.5 \, {\rm m}^3$ Miscellaneous Activated **Reactors and Ponds** Activated components including stainless steel Components compacted liners dry stored in stainless steel containers, shield plugs and coupling. (amount thought to be rather low- PJ to check) Various components will be left in the reactor including: control rods, boron balls, and neutron sources (latter may be LLW). It was confirmed that there was no FED. 38.6 m<sup>3</sup> Activated components include reactor furniture (2-3 Reactors (90%) and Miscellaneous Reactor m<sup>3</sup>); holding down weights, support struts, and Components Cooling ponds thermocouples. Mainly steel but some magnox and Al (10%) cladding and graphite materials. Stored in skips (wet and dry storage). 48.8 m<sup>3</sup> Ion exchange resins Fuel storage ponds Spent AW500 zeolite ion exchange resins. 48 spent resin components in storage and up to another 12 in use. 8 m<sup>3</sup> Sludges containing corrosion products from the ponds. Sludges Cooling pond Corrosion products from ponds. Around 2 m<sup>3</sup> is stored building in skips: the remainder is in detention tanks. CXPP ceramic pellets $9.7 \, {\rm m}^3$ Dry stored in 2020 bottles and stainless steel cans in temporary storage vessels. 18.5 m<sup>3</sup> (may include materials at Harwell) BM and PJ checking these figures. CXPP Includes tritium contaminated steel plant (pipes, Contaminated plant components $3.6 \text{ m}^3$ valves, etc) and graphite. Stored in disposable flask liners.

#### ILW waste material description

Waste material name	Current location	Total amount	Description
Rotary Pump Oil	CXPP	Max 0.5 m <sup>3</sup>	Tritium contaminated oil. Stored in stainless steel cans
Fuel skips in ponds 1 & 2	Ponds 1 & 2	200 m <sup>3</sup>	190 skips of mild steel with Cs surface contamination present in the paint. This could be cleaned by jet washing – possibly to LLW levels.
Dessicant	Reactor building	0.4 m <sup>3</sup>	800 kg Al in the form of pellets, heavily loaded with tritium in humidriers; no activity assessment at moment.
Spent furnaces	CXPP	6 units (0.25 m3)	Tritium and depleted uranium contamination. Composed of a steel outer case and uranium inner lining.
Spent sources	Health Physics source store	97	Sources with maximum activity of 300 Bq each. Possibility of being disposed of as LLW.
C&M preps waste			
CXPP Dismantling ILW		237.0 m <sup>3</sup>	POCO and plant cleanout wastes e.g. vacuum furnace, pipework. Materials include stainless steel some alloys, plastic, o-rings and stack pumps with tritium and some activation product contamination.
			Rotary and diffusion pumps and motors may also be contaminated – these have yet to be tested (this would presumably increase the volume for disposal)
Heat Exchanger dismantling		Amounts?	It is possible that the heat exchanger components may be contaminated with graphite dust. If so, would be considered as ILW (contamination levels to be verified by testing).

## APPENDIX H. BRIEFING MATERIALS FOR LLW SCORING

# Scoring workshop – LLW briefing materials

#### **Objective:**

To score the potential management options for LLW identified within the study and to determine the BPEO.

## Stages:

- 1. Review the options and their definitions
- 2. Review the screening criteria and then screen out any options that are not viable
- 3. Review the attributes and their calibration schemes
- 4. Score the options
- 5. Agree and apply weighting schemes
- 6. Determine the BPEO

Julie Tooley, Carol Robinson and Gavin Thomson Enviros Consulting 1 March 2007

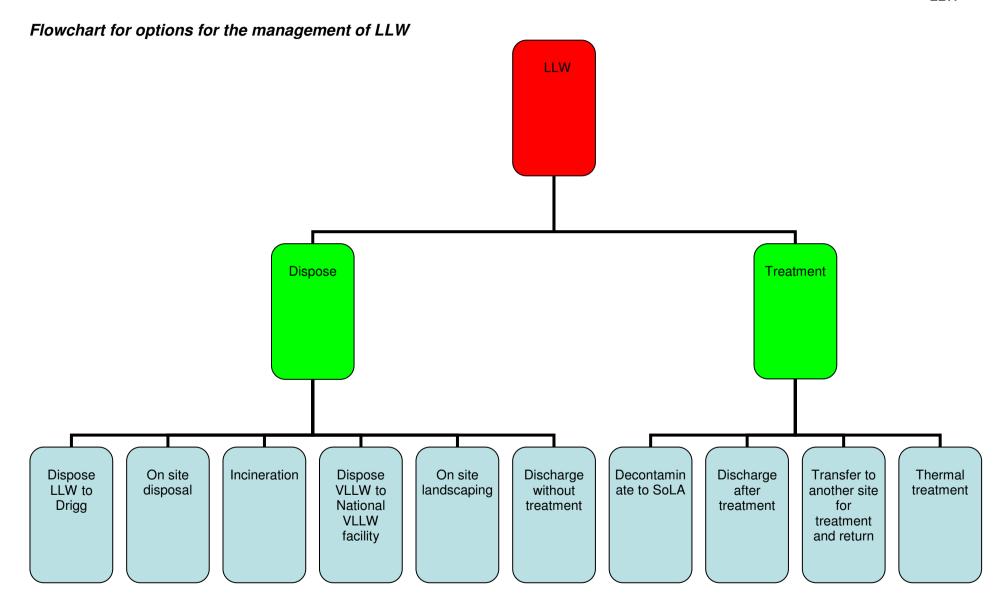
Waste groupings for LLW To ensure the BPEO is comprehensive yet manageable certain LLW waste streams have been grouped.

	Segregatable	Metal	Asbestos	Aggregate	Chemicals	Glass	Oils and Oily wastes	Cellulose	Plastic	Rubber	Soil	Contaminate d water	Contaminate d air
	Ň	Ž	Ä	Ă	Ū	Ū	ŌŠ	Ŭ	P	Ē	Ň	σŬ	ŬΦ
Operational waste													
CXPP tritiated waste	$\checkmark$							$\checkmark$	$\checkmark$				
Reactor and associated areas LLW	✓		✓					✓	✓	✓			
Cooling ponds LLW	✓			✓				✓	✓				
Large Items from Reactor Areas	~	~						✓	~	<b>√</b>			
Large items from Cooling Ponds	~	~						✓	~	<b>√</b>			
UO3 contaminated LLW	✓							✓	✓	✓			
Oils (lubricating and hydraulic)	Х						~						
Other liquid organic wastes	Х				~								
Hydraulic fluids	Х				✓								
Liquid effluent discharges (Pond)												~	
Liquid effluent discharges (CXPP)												~	
Aerial effluents			1	Ī	Ī		Ī	1					$\checkmark$
C&M Preps													
Reactor LLW	$\checkmark$	✓											
Ponds LLW	$\checkmark$	$\checkmark$		$\checkmark$							$\checkmark$		

## BPEO study for evaluation of decommissioning wastes at Chapelcross Scoring Workshops –March 2007 LLW

	Segregatable	Metal	Asbestos	Aggregate	Chemicals	Glass	Oils and Oily wastes	Cellulose	Plastic	Rubber	Soil	Contaminate d water	Contaminate d air
Active effluent pipeline concrete LLW	✓			<b>v</b>									
Active effluent pipeline steel LLW	~	~											
North Site LLW	~	~		~									
CXPP dismantling LLW	✓	✓		✓									
General reactor LLW	$\checkmark$								$\checkmark$				

BPEO study for evaluation of decommissioning wastes at Chapelcross Scoring Workshops –March 2007 LLW



## Options for management of LLW

**Principles:** 

- All waste will be sorted and segregated and decontaminated then conditioned by some process
- Wastes with similar characteristics can be grouped

	Decontaminate to SoLA	Incineration	On-site landscaping	On-site disposal (facility)	Dispose of vLLW separately	LLW to Drigg	Treatment and discharge	Discharge	Thermal treatment	Transfer to another site	No. of Options
Metal	<ul> <li>✓</li> </ul>			✓	✓	✓			✓	✓	6
Asbestos						$\checkmark$			✓		2
Aggregate	✓		✓	✓	✓	✓					5
Chemicals	✓	✓				✓					3
Oily wastes	✓	✓									2
Cellulosic		✓		✓	✓	✓					4
Plastic & Rubber	✓	✓		✓	✓	√					5
Soil			✓	✓	✓	$\checkmark$					4
Water							✓	✓			2
Air							$\checkmark$	$\checkmark$			2

#### Description of options

#### Low level waste

#### Disposal

#### Dispose at Drigg

Disposal at Drigg is an established route for LLW which falls within the specification set out in the Conditions for Acceptance. Wastes which fall outside the specification set out in the conditions for acceptance may under certain circumstances be disposed under special arrangements. Drigg has limits on the radionuclides and activity it is able to accept set out in the authorisation granted under RSA93. Generally waste of a conventional hazardous nature such as putrescible, pyrophoric and explosive are not accepted and in general waste has to be immobilised to prevent migration of radionuclides from the containers into the facility and beyond.

#### Dispose on site

This would require the building of a new disposal facility. Waste may need further conditioning or treatment to passive safety whilst the facility becomes available. It is foreseen that this option would require the construction of a new store on the site because existing buildings on the Chapelcross site are not suitable or are planned to be decontaminated or demolished as part of the planned site restoration programme.

#### Incineration

Solid radioactive waste that is combustible or is not suitable for disposal to landfill because of hazardous properties can be authorised for disposal by incineration at an authorised incinerator. Incineration often results in a large volume reduction and release of volatile radionuclides from the waste. It is normal for the resultant ash to be disposed of as a solid waste.

#### Dispose VLLW to a National VLLW facility

It is now widely agreed that there is a significant amount of waste from decommissioning that contains low levels of radionuclides at the bottom end of the levels currently considered to be LLW and often referred to as VLLW (or sometimes the terminology High Volume Low Activity HVLA or Very Low Radioactive Material VLRM). DEFRA is currently reviewing the waste management policy for LLW within the UK. As part of this it is possible that separate waste management options for the disposal of VLLW could be identified and promoted.

Currently no such disposal route exists in the UK, although some landfill sites do accept radioactive wastes under special precautions burial (Option 2.1.5). It is generally considered that VLLW will be defined as an inert waste.

#### On site landscaping

This is envisaged to be the use of inert construction and demolition material predominately for the infill of turbine hall basements or other landscaping remediation.

#### Discharge without treatment

This is primarily considered to be an option for liquid wastes such as cooling pond water and groundwater control practices.

#### **Treatment**

#### Decontaminate to SoLA

The removal of areas of surface contamination would allow material to be exempted from the RSA93 using, for example, the Substances of Low Activity Exemption Order. Such decontamination may be possible using simple techniques such as wiping or washing or more aggressive techniques such as high-pressure jet washing.

#### Discharge after treatment

This is envisaged to include the discharge of liquid waste following treatment at the effluent treatment plant or aerial discharges from active ventilation systems.

#### Transfer to another site for treatment and return

This is an interim option which would result in the waste product returning to Chapelcross for inclusion in another final disposal option.

#### Thermal treatment

This option in envisaged for waste contaminated only with tritium. The waste would be heated to volatilise the tritium which would be disposed as an aerial discharge. The aim would be that the heated waste would be below SoLA levels.

#### Screening criteria

#### Derived from regulation

Criterion	Name	Description
1	London Convention	Disposal of solid radioactive waste at sea is suspended indefinitely.
2	OSPAR Convention	Waste producers are required to take all possible steps to reduce concentrations of natural radionuclides in the north eastern Atlantic to close to background, and close to zero for artificial radionuclides, by 2020.
3	Groundwater Regulations	The disposal of liquid wastes containing certain listed substances into groundwater is forbidden by the Groundwater Regulations.
4	Dose limits	The annual individual dose to members of the public must not exceed 1 mSv/yr. Doses to workers are limited to 20 mSv/yr averaged over five years (other limits also apply).

#### Derived from Government policy and guidance

5	Waste import and export	Radioactive waste may only be exported to (or imported from) elsewhere in small quantities and under special conditions.
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## Attributes

Relevant attributes developed at the optioneering workshop

Attribute group and attribute	Sub-attribute
Human health and safety:	
1. Public health and safety (individuals)	<ol> <li>1.1 Routine radiation doses</li> <li>1.2 Radiological accident risks</li> <li>1.3 Non-radioactive hazards and risks</li> </ol>
2. Public health and safety (societal collective dose)	2.1 Routine radiation doses
3. Worker health and safety (individuals)	<ul><li>3.1 Routine radiation doses</li><li>3.2 Radiological accident risks</li><li>3.3 Non-radioactive hazards and risks</li></ul>
Environmental impact:	
4. Physical environment	<ul> <li>4.1 Air quality</li> <li>4.2 Water quality of receiving body</li> <li>4.3 Land</li> <li>4.4 Visual impact</li> <li>4.5 Nuisances (noise, light, dust, odour, vibration)</li> <li>4.6 Use of natural resources</li> <li>4.7 Transport</li> </ul>
5. Flora and fauna	5.1 Preservation of ecosystems
6. Environmental objectives	<ul> <li>6.1 Waste volumes</li> <li>6.2 Waste hierarchy</li> <li>6.3 Hazard reduction rate</li> <li>6.4 Concentrate and contain</li> <li>6.5 Generation of secondary wastes</li> <li>6.6 Greenhouse gas emissions</li> <li>6.7 Proximity principle</li> </ul>
Technical:	

7. Viability	7.1 Maturity of technology
	7.2 Continued availability of option
	7.3 Throughput/capacity of option
8. Nuclear safety	8.1 Likelihood of meeting CfA
9. Flexibility	9.1 Foreclosing of options
10. Programme	10.1 Scheduling variance compared to LTP
	10.2 Minimising project risk to NDA
	10.3 Discharge of NDA liabilities
	10.4 Consistency with site end state
Socio-economic:	
11. Local community	11.1 Economic impacts
	11.2 Culture and heritage
Regulatory issues:	
12. Acceptability	12.1 Likelihood of gaining regulatory acceptance
Financial cost:	
13. Overall cost	13.1 Total undiscounted cost
	13.2 Rate of spend compared to LTP
	13.3 Stability of cost estimates

## Scoring criteria

In the absence of appropriate data on the performance of some options, only the calibration of scores 0 and 5 has been provided. Scores 1 - 4 can be awarded on the basis of expert judgement on the relative performance of options against the 0 and 5 requirements, and relative performance between options.

Attribute/ sub-attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)		
1. Public health and safety (individ	luals)			
1.1 Routine radiation doses	Difficult to demonstrate doses <1 mSv y <sup>-1</sup> (Basic Safety Limit - BSL)	Easy to demonstrate doses <10 μSvyr <sup>-1</sup> ('below regulatory concern')		
1.2 Radiological accident consequences	Unacceptably high consequence	Low consequence		
1.3 Non-radioactive hazards and risks	Difficult to demonstrate risk <10 <sup>-4</sup> yr <sup>-1</sup>	Easy to demonstrate risk <10 <sup>-6</sup> yr <sup>-1</sup> ('below regulatory concern')		
2. Public health and safety (societ	al collective dose			
2.1 Routine radiation doses	Difficult to demonstrate doses <100 person Sv	Easy to demonstrate doses <1 person Sv		
3. Worker health and safety (indivi	iduals)			
3.1 Routine radiation doses	Difficult to demonstrate doses <20 mSv y <sup>-1</sup> (Basic Safety Limit – BSL)	Easy to demonstrate doses <2 mSv y <sup>-1</sup> (Basic Safety Objective - BSO)		
3.2 Radiological accident consequences	Unacceptably high consequence	Low consequence		
3.3 Non-radioactive hazards and risks	Difficult to demonstrate risk <10 <sup>-3</sup> yr <sup>-1</sup> (largest tolerated risk where activity is crucial for society and economy)	Easy to demonstrate risk <10 <sup>-5</sup> yr <sup>-1</sup> (consistent with typical 'safe' practice in non nuclear industry)		
4. Physical environment				
4.1 Air quality	Persistent objectionable substances in air in buildings off site	No discernible reduction in air quality		
4.2 Water quality	Sterilisation of water resource off site or affects ability to reach site end-point	No discernible reduction in water quality		
4.3 Land quality	Sterilisation of substantial area of land off site or affects ability to reach site end-point	No discernible reduction in land quality		

Attribute/ sub-attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)		
4.4 Visual impact	Construction completely out of keeping with existing landscape	No discernible visual impact		
4.5 Nuisances (noise, light etc)	Long-term disturbance/disruption of local life	No outward signs of the material management scheme		
4.6 Use of natural resources	Unacceptably high use of resources and practice not sustainable	Limited use of resources and managed in a sustainable way		
4.7 Transport	Unacceptably high increase in off site transport operations	No increase in off site transport operations		
5. Flora and fauna				
5.1 Preservation of ecosystems	Complete loss of natural ecosystem	No discernible reduction in quality of the natural ecosystem		
6. Environmental objectives		·		
6.1 Waste volume	Unacceptably high volumes of waste generated	Lowest volumes of waste generated		
6.2 Waste hierarchy	Inconsistent with waste hierarchy and no material is reused or recycled, and there is no possibility that it ever can be	Consistent with waste hierarchy and all material is reused and none disposed		
6.3 Hazard reduction	No reduction in hazard or hazard is increased over the long term	Hazards associated with the materials are reduced to a minimum, as rapidly as feasible		
6.4 Concentrate and contain	Radioactivity is dispersed to the wider environment and no long remains under engineering or management control	Radioactivity is contained by passive engineered systems, and remains under management controls		
6.5 Generation of secondary wastes	Large amounts of secondary waste produced far in excess of original waste volume	Limited secondary waste produced		
6.6 Greenhouse gas emissions	Increase in greenhouse gas emissions	Reduction in greenhouse gas emissions [N.B. Score of 3 = no change]		
6.7 Proximity principle	Waste management option undertaken at distant location	Waste management option undertaken on-site		
7. Viability				
7.1 Maturity of technology	Unproven and not achievable with existing technology in timescale of LCBL	Established approach, with good track record and applied under similar circumstances.		

Attribute/ sub-attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)		
7.2 Continued availability of option	Not existing and could not be procured in timescale of LCBL	Existing and is available		
7.3 Throughput/capacity of option	Throughput or capacity is very low and will adversely affect LTP	Throughput or capacity meets or exceeds demand and results in no impact on LTP		
8. Nuclear safety				
8.1 Likelihood of meeting Conditions for Acceptance	Significant dialogue required to meet Conditions for Acceptance	Conditions for Acceptance previously meet for similar wastestream		
9. Flexibility		·		
9.1 Foreclosing of options	Once implemented, no possibility for reversible steps or retrieval of material	Flexible option that allows for reversibility and easy retrieval of material		
10. Programme		·		
10.1 Scheduling variance compared to LTP	Would cause substantial delays to activities on site that lie on critical path, causing failure to meet LCBL objectives and timescales	Can be achieved independently of other activities on site and without impacting on the timing and ordering of other activities		
10.2 Minimising project risk to NDA	Significant project risk to NDA	No additional project risk to NDA		
10.3 Discharge of NDA liabilities	NDA liabilities increase in scale or in time	NDA liabilities significantly reduced in scale or period of liabilities significantly shortened		
10.4 Consistency with site end state	Completely inconsistent with defined site end state	Consistent with defined site end state		
11. Local community				
11.1 Economic impacts	Collapse of local economy	Major enhancement to the local economy [NB Score of 3 = no change]		
11.2 Culture and heritage	Collapse of local community through depopulation	Major enhancement of local community [NB Score of 3 = no change]		
12 Acceptability				
12.1 Likelihood of gaining regulatory acceptance	Significant dialogue required to gain approval	Demonstrable precedent exists		
13. Overall cost	•	·		

Attribute/ sub-attribute	Requirement for intolerable performance (Score = 0)	Requirement for ideal performance (Score = 5)		
13.1 Total undiscounted cost	Significant undiscounted cost above LTP cost estimates	Undiscounted cost likely to remain within LTP cost estimates [NB Score of 3 = no change]		
13.2 Rate of spend compared to LTP	Significantly different to LTP cash flow forecast	Likely to remain within LTP cash flow forecast [NB Score of 3 = no change]		
13.3 Stability of cost estimates	Cost estimates highly unstable	Cost estimates highly stable		

#### Scoring

Score each of the 10 waste groups (Metal, Asbestos etc...) on separate Excel spreadsheets using the attributes and scoring schemes presented above. A master version for LLW is provided electronically, create one for each waste group using Save As noting that not all management options are relevant to all waste groups (an example for Metals is also provided).

Please return to <u>gavin.thomson@enviros.com</u> by close of play 9<sup>th</sup> March 2007.

## Weighting schemes

Weightings are usually applied to the total scores for each attribute group, and often normalised to take account of the number of sub-attributes in each group to avoid biasing those with the most sub-attributes.

Example: If the unweighted score for an option in the Technical attribute group is 25, the chosen weighting factor is 10, and there are 6 sub-attributes in the group, then the normalised weighted score for the group is  $(25 \times 10) / 6 = 41.7$  (to 1 decimal place)

The weighting schemes applied the Chapelcross wastes option study are.

Attribute group	Enviros Team Weighting	Technology position	Environmental position	Financial position
1. Human health	5	10	10	1
2. Environmental impact	5	1	10	1
3. Environmental objectives	5	1	10	1
4. Technical	5	10	1	1
5. Socio-economic	5	1	1	1
6. Stakeholder issues	1	1	10	1
7. Financial cost	1	10	1	10

## Determine the BPEO

The BPEO may be determined by comparing:

- the total unweighted scores for the options (which gives the highest score ?)
- the total unweighted scores, less costs, for the options (which gives the highest score without cost bias ?)
- the number of scores of 0 and 5 awarded to each option (which performs well across all attributes ?)
- the various total weighted scores for the options, and the sensitivity to the weighting factors (is the ranking robust to weighting ?)

#### Determining the preferred management strategy

The determination of a BPEO is only one factor that should be taken into account when choosing a management strategy, for example:

- An option that performs *better* environmentally than the BPEO could be adopted if there are other business factors to take into account (e.g. to protect or to foster the environmental reputation of the organisation – the 'Brent Spar' example).
- An option that performs *marginally worse* than the BPEO could be adopted if there is a large financial saving to be made and the environmental performance of the adopted option still meets appropriate constrains and conditions (the proportionality argument)

## LLW waste material description

Waste material name	Current location	Total amount	Description
Operational waste			
CXPP tritiated waste	CXPP	4 m <sup>3</sup> per year. Around 20 m <sup>3</sup> in total	Mainly soft waste (clothes, gloves, tissues etc). Stored in alkathene containers in 205 I drums (waste and containers combustible). Not suitable for super compaction (due to potential for H-3 release).
Reactor and associated areas LLW	In reactors and CXPP	Current arisings 74 m <sup>3</sup> per year (3 isofreights) during normal operations. Expected to increase to 120 m <sup>3</sup> per year (peak at 300 m <sup>3</sup> /y) during defuelling.	Soft waste (PPE and fabric) Stored in 205 I drums (as above).
Groundwater ingress into reactor basements		300,000 gallons per year Annual average - subject to seasonal variations with greatest amount during winter.	Groundwater tritiated to around 0.2-0.4 Bq/ml. Removed by pump and discharged through existing discharge pipeline.
Cooling ponds LLW		Current average 6.4 m <sup>3</sup> per year. Will peak during decommissioning	Soft waste arising from flask cleaning (wipes etc.) primary contaminant Cs. The peak expected during repackaging of waste from ponds. Stored in 205 I drums.
Large Items from Reactor Areas		892.0 m <sup>3</sup> (Total figure)	Comprises steel plant and equipment (primarily various grades of steel and some lead) including: contaminated charge baskets; redundant flasks (PRDO); grabs, BCGDs (cast steel). Not expected to be activated or contaminated with PCBs.

Waste material name	Current location	Total amount	Description
			Wrapped and stored in HHISO
Large items from Cooling Ponds		15.6 m <sup>3</sup> per year (current operational arisings). Underestimates of the total during C&M preps	Comprises grabs, pumps, lights, scaffold boards. Wrapped and loose stored in HHISO
UO <sub>3</sub> contaminated LLW	Building 141	16.0 m <sup>3</sup> (reasonable estimate of total value)	Soft waste and plywood boards Stored in 205 I drums
Oils	Hanger 39 (following dismantling of Tank Farm)	84,000 l 164.5 m <sup>3</sup>	Comprises a mix of liquid organic waste stored in plastic double lined tanks. Approx. 50,000 l of this amount exempt under SoLA. Remainder (approaching 40,000 l) will be stored on site pending authorisation. Trace beta contamination (H-3 and C-14 activities below 0.4 Bq/g). An additional 50,000 l oily waste in blowers (levels of activity to be tested).
Other liquid organic wastes		400 MBq H-3 200 kBq C-14 and S-35	Scintillant
Hydraulic fluids	B151 (CXPP)	0.25 m <sup>3</sup>	Stored in 55 plastic bottles mixed with vermiculite within stainless steel drums. Unsuitable for further treatment.
	<mark>?</mark>	<mark>0.7 m³</mark>	Oil in free state (not mixed with vermiculite) – Norman to check?

Waste material name	Current location	Total amount	Description
Liquid effluent discharges from Pond		Total volume of 3 ponds around 1.2 million gallons (400,000 gallons each)	Discharge pipeline common to ponds and CXPP. Present discharge rate approximately 20 discharges of 13,000 gallons per year (3% of current discharge authorisation).
Liquid effluent discharges from CXPP		850 gallons discharged 2-3 times per year	See above
Aerial effluents	Processing plant (little from reactors)	200 TBq per year (Current authorised limit 5000 TBq/y)	Aerial discharge primarily H-3. Some C-14 is discharged from reactors. Residual discharge of C-14 expected during C & M Preps.
C&M preps waste			
Reactor LLW		4370.6 m <sup>3</sup> (70% confidence in this total value)	Comprises large plant components, including: defuelling machines; turbo generators; heat exchanger pipework; blowers; building fabric; iron ductwork; transformers; generators; large lead acid batteries; MMMF; switch gear scaffolding poles. Materials include cast steel (not much stainless steel); cement- bound asbestos; brickwork and reinforced concrete. All surface contaminated. Metals may be decontaminated but decontamination of other materials would be difficult. Not suitable for super compaction The amount is based on the assumption that building slabs left intact and that rail and related structures remain (subject to confirmation of plans for rail links).
Ponds LLW		2330.0 m <sup>3</sup>	Comprises full pond structure (assuming walls contaminated to depth) including the walls; redundant

Waste material name	Current location	Total amount	Description
		(confident of this value based on Quantity Survey figures)	flasks; furniture and concrete. Not suitable for super compaction
Redundant Active effluent pipeline concrete LLW		1335.0 m <sup>3</sup>	Cast concrete. Not suitable for super compaction. The management option for this pipeline is still under debate – removal not certain).
Replacement active effluent pipeline steel LLW		28.0 m <sup>3</sup> Number considered to be low - TBC	Spun Steel (4 miles long, 15 inch diameter, inch thick); Surface contaminated with Cs and Sr. Not suitable for super compaction
North site LLW	Currently in temporary storage building – expected to be removed before C&M Preps	270.0 m <sup>3</sup>	Not suitable for super compaction. This amount does not include cooling towers – considered to be clean (due for demolition in April 2007).
CXPP dismantling LLW (of the process line)		325.0 m <sup>3</sup>	This category relates to the containment of the process line (not including building structure). It comprises tritiated equipment (pumps, valves etc) of largely metal construction. Not suitable for super compaction Additional information from Norman?
Contaminated land			Not included in the scope of this BPEO. It was noted that decisions related to Regulatory issues related to H-3 contaminated groundwater is interfering with management of hydrocarbon contaminated land.