

Radioactive Waste Disposal Implications of Extending Part IIA to cover Radioactively Contaminated Land

DJ Nancarrow and MM White, Atkins Environment
Woodcote Grove, Ashley Road, Epsom KT18 5BW
July 2003

Abstract

A short study has been carried out of the potential radioactive waste disposal issues associated with the proposed extension of Part IIA to address radioactively contaminated land, where there is no other suitable existing legislation.

It was found that there is likely to be an availability problem with respect to disposal at landfills of the radioactive wastes arising from remediation. This is expected to be principally wastes of high volume and low activity (categorised as low level waste (LLW) and very low level waste (VLLW)). This availability problem results from a lack of applications by landfill operators for authorisation to accept such wastes for disposal. It is apparently due to perceived adverse publicity associated with the consultation process for authorisation coupled with uncertainty over future liabilities. Disposal of waste as VLLW is limited both by questions over volumes that may be acceptable and, more fundamentally, by the likely alpha activity of wastes (originating from radium and thorium operations).

Authorised on-site disposal has had little attention in policy and guidance in recent years but may have a part to play especially if considered commercially attractive.

Disposal at BNFL's near surface disposal facility for LLW at Drigg is limited to wastes for which there are no practical alternative disposal options (and preference has been given to operational type wastes). Therefore wastes from the radioactively contaminated land (RCL) regime are not obviously attractive for disposal to Drigg. Illustrative calculations have been performed based on possible volumes and activities of RCL arisings (and assuming Drigg's future volumetric disposal capacity is 950,000 m³). These suggest that wastes arising from implementing the RCL regime, if all disposed to Drigg, would not represent a significant fraction of the volumetric capacity of Drigg but could have a significant impact on the radiological capacity with respect to ²²⁶Ra plus ²³²Th.

The Government's decision-making programme for managing solid radioactive wastes in the UK may possibly achieve a general consensus that the use of landfill for LLW from the RCL regime has a fundamental role to play. However, this is unlikely to change the situation within the next few years. No new national facility arising from this programme is likely to be available during the first decade of the operation of a new RCL regime. Hence it appears that Drigg will need to play an important role for some years to come.

1. Background

Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) introduced a new statutory regime for the identification and remediation of contaminated land. This became effective in England from 1 April

2000 and subsequently, with some modifications, in Wales and Scotland. The new regime, described for England in Circular 2/2000 does not, however, currently apply to any **radioactive** contamination of land.

Part IIA makes provision for the regime to be applied to radioactive contamination with such modifications as the Secretary of State considers appropriate. This would be effected by regulations made under Section 78YC of the Environmental Protection Act 1990 (inserted by section 57 of the Environment Act 1995). The Department for the Environment, Food and Rural Affairs (Defra) has therefore been examining the nature of the modifications that would be required to extend the regime to the identification and remediation of radioactively contaminated land (RCL), not within licensed nuclear sites. In this regard, Atkins has provided a range of task-related technical support to Defra and to a Steering Group established by Defra. The latter included representation from: Defra; the National Radiological Protection Board (NRPB), the Environment Agency; the Scottish Environmental Protection Agency (SEPA); the Scottish Executive; The National Assembly for Wales; and Atkins.

2. This study

Atkins carried out a short study of the potential waste disposal issues associated with the proposed extension of Part IIA to address RCL. This was reported as a discussion paper to the RCL Steering Group in December 2002. Although some of the same points have been made in a recent RWMAC report [1], the Steering Group felt that a shortened version of the paper could be useful in a wider context. This is because, although the proposed RCL regime is not considered to introduce any fundamentally new waste disposal issues, it is likely to exacerbate existing waste disposal challenges or at least to result in those responsible for implementing the regime encountering existing problems.

3. Authorised disposal of low level waste to landfill

Disposal Options

The 1982 Guidance to the Radioactive Substances Act 1960 [2] identifies two options for the disposal of LLW to landfill. The first, referred to as “special precautions burial”, appears to be for small volumes of LLW only: the Guidance stipulates that the waste should be transferred to the disposal site in “a plastic or multi-layer paper sack”¹. Whilst it specifies limits on the maximum activity contained in any one sack¹, the guidance makes no reference to the total number of sacks that may be disposed of in one consignment. It is unlikely that this method of disposal would be suitable for the large volumes of LLW likely to arise from the remediation of RCL.

The second option identified in the 1982 Guidance is more applicable, involving the disposal of “demolition wastes and other high volume wastes having a radioactive content of less than 4 Bq/g”. The Guidance recommends that such wastes “should normally be authorised for removal to a tip and burial at a depth of at least 1.5m”.

¹ Limits of 4 MBq of radionuclides with a half life of greater than one year and 40 MBq of others.

Cm 2919 [2] does not make specific reference to these two disposal options, but does talk in general terms about the “controlled burial” of LLW on landfill sites. The paper concludes that the Government would not “encourage greater use of controlled burial by the nuclear industry” but that it considered that “controlled burial should continue to be available as a disposal route, particularly for small users... subject to the agreement of the site operators...”.

Despite having been previously advocated in Government policy and guidance, the use of landfill to dispose of LLW has declined over recent years. In a paper addressing the problems of small users of radioactive materials [3], RWMAC suggested that this decline is due to Government’s policy to move away from the landfilling of all wastes, in preference for waste management options further up the waste hierarchy. However, it is suggested here that the decline is more likely to be due to changes in the Environment Agency’s regulatory approach and the reluctance of some landfill site operators to handle radioactive wastes.

The majority (if not all) of the extant authorisations permitting the disposal of LLW to landfill were granted several decades ago. At that time, the practice of the authorising body was to grant the authorisation to dispose of LLW to landfill to the owner of the premises generating the waste (under Section 13(1) of the Radioactive Substances Act 1993), rather than the owners or operators of the sites receiving them (under Section 13(3)). The conditions of authorisation specify the sites to which the waste is to be disposed of and any special precautions to be taken during its disposal (e.g. burial at a depth of greater than 1.5m below the surface of the non-radioactive waste), as well as various limits on its activity or the concentration of radionuclides it may contain.

No applications for new authorisations to dispose of LLW to landfill have been made in recent years. However, the Environment Agency now considers that it is preferable to authorise the *operator* of the disposal site and for a separate transfer authorisation to be granted to the operator of the site generating the LLW [3]. This change of regulatory approach was taken in recognition that it was unreasonable to impose conditions relating to the manner in which the waste should be disposed of (i.e. the special precautions that should be taken) on the generator of the waste, rather than the operator of the landfill. It is understood that this approach is also in line with that taken for disposing of radioactive waste to merchant incinerators (*pers. comm.* D Bennett, Environment Agency, 2002).

This new approach means that those responsible for remediating contaminated land would need to rely upon landfill operators to ensure that this disposal option is available and to make the relevant application for an authorisation under section 13 of RSA93.

Practical problems with availability

There appear to be two main reasons why landfill operators have not applied for authorisations to dispose of LLW: the perceived likely adverse publicity associated with the consultation process associated with authorisation; and uncertainty over the resulting future liabilities. These are discussed in turn below.

In accordance with the policy outlined in *Cm 2919*, the Environment Agency is to consult the local authority when determining an application by a landfill operator for an authorisation to dispose of LLW to landfill. There is no statutory or government policy requiring *public* consultation. However, the Agency's internal guidance on authorising disposals of radioactive waste from non-nuclear premises indicates that "any new application to dispose of LLW by controlled burial... will trigger the Agency's *Selected Licence Application Procedure* which provides for public consultation" [2]. Communications with the Environment Agency suggest that it is the likely adverse publicity associated with the consultation process that is discouraging landfill operators from applying for authorisations.

The second possible reason for landfill operators not to apply for authorisation to dispose of radioactive waste is uncertainty over the resulting future liabilities. The regulation of the management of non-radioactive wastes is well developed and takes account of potential future liabilities that landfill operators may face. Section 74 of Environmental Protection Act 1990 (EPA90) requires that the holder of a waste management licence makes adequate financial provision to be able to cover the obligations arising from the licence for its duration. Financial provision may be made in the form of a number of mechanisms that allow the Agency access to it in the event of the licence holder being unable or unwilling to fulfil the obligations.

No such regime exists for the disposal of radioactive waste and it is not apparent how the disposal of LLW to landfill will affect the financial provisions that landfill operators will have to make under Section 74 of EPA90. For example, if a landfill operator is required to undertake remedial work on a closed landfill (for which the waste management licence is still extant), the presence of long-lived radioactive waste (for example the radionuclides ²²⁶Ra and ²³²Th) in the landfill may increase the costs associated with that remedial work. It is unlikely that such costs would have been considered when the financial provisions required under EPA90 were established.

In principle, disposal to landfill is likely to be the most appropriate option for the disposal of much of the LLW arising from the management of RCL. Such wastes will be of a high volume but most are likely to contain relatively low levels of radioactivity. British Nuclear Fuels plc (BNFL) accepts LLW for disposal at its near-surface disposal facility at Drigg in Cumbria. However, wastes have to meet the relevant "Conditions for Acceptance" [8] (as discussed further in section 6). Disposal of LLW arising from the management of RCL would be not only expensive but also may not meet these Conditions. BNFL also currently gives preference to the disposal at Drigg of "operational waste" over "decommissioning waste", whilst exempt solid radioactive waste may not be disposed of to Drigg [8,9]. Given these constraints and the need to use a national resource appropriately, it is clearly desirable that the landfill disposal option should be available for LLW arising from the remediation of RCL sites.

Possible solutions

In principle, the likely adverse publicity associated with the public consultation process could be avoided if the Environment Agency were to decide not to undertake public consultation (whilst continuing to consult local authorities in accordance with *Cm 2919* [2]). It could instead revert to authorising the person requiring the waste to

be disposed. Such “one-off” disposals would only be made for a limited period of time (until the remedial action was complete), this being distinct from that of a landfill operator making an application to accept LLW for disposal (possibly from more than one premises) on a routine basis. However, this would not sit comfortably with the Environment Agency’s general approach, which is that consultation is important in contributing to openness and transparency and helps to ensure better decisions are made.

Moreover, the former Environment Minister, Michael Meacher, in a Commons Written answer of 6 May 2003, has affirmed the importance of consultation with respect to landfilling as is seen from the Hansard extract below:

Norman Baker: To ask the Secretary of State for Environment, Food and Rural Affairs whether it is her policy to allow indefinite disposal of low-level radioactive waste at landfill sites. [109625]

Mr. Meacher: Current policy for controlled burial of low level radioactive wastes at landfill sites is set out in the 1995 White Paper "Review of Radioactive Waste Management Policy: Final Conclusions" (Cm2919). The White Paper concluded that controlled burial to landfill should continue to be available as a disposal route, particularly for "small users" of radioactivity—such as hospitals, universities, research laboratories and non-nuclear industries—subject to agreement of the site operators and the necessary regulatory requirements being met. In addition, I accept that the agreement of local residents is also important. Despite acknowledging that there might be sound economic and radiological grounds for encouraging greater use of controlled burial to landfill, Cm2919 concluded that its greater use by the nuclear industry should not be encouraged due to genuine anxieties that the proposal aroused among local residents.

Another way, in principle, to address the availability issue would be (via legislative change) to place a duty on landfill operators to accept LLW arising from RCL sites. The operator would need to dispose of the waste in accordance with the conditions in the authorisation (albeit one not in the landfill operator’s name). These powers would not be completely new: under the provisions of Section 18(3) of RSA93, local authorities (the bodies responsible for operating landfill sites at the time of enactment) had a duty to accept authorised waste for disposal at the sites for which they were responsible. The authorising body was still required to consult them when determining applications. In principle, such an approach could be extended to include consultation with the private landfill operator. Indeed, in the case of the foot-and-mouth disease, the government directed certain landfill operators to accept FMD wastes in the national interest. However, the placing of a duty to accept RCL would be politically highly sensitive and would be difficult in the context of the higher profile now given to financial liability issues and in the determination of the full cost of disposal.

An alternative means of ensuring that the option of disposing of LLW to landfill is available, which would not require the Environment Agency to change its consultation policy or regulatory approach, would be for the Government to establish an acceptance of the option by local authorities and the public. This would also be more in line with the Environment Minister’s concerns about public fears over the controlled burial of LLW. The Government is embarking on its proposed decision-making programme for managing solid radioactive waste in the UK [4]. The programme will involve an independent body being appointed to oversee a review of the options for managing all radioactive wastes for which there are no current long-

term management routes available, with a view to establishing a widely agreed strategy. During the review process, the body will seek the views of interested stakeholders, the public and government departments.

It is likely that it is only by winning a general consensus that the use of landfill for the disposal of less active LLW has a fundamental role to play in radioactive waste management, will the option become acceptable to the public. Landfill operators may then consider public consultation as less of a deterrent to applying for an authorisation. However, if this approach is to work, it is suggested that the option of disposing of LLW to landfill will need to be given a much higher priority in the programme than it currently appears to have been given: a recent consultation paper [4] has only made a passing reference to the option.

The Government's proposed decision-making process is due to be complete in 2007. Therefore, even if the outcome is a greater acceptance by the public of disposal of LLW to landfill, this is unlikely to address availability for the commencement of the RCL regime. An interim strategy for the management of LLW arising from the remediation of RCL will, therefore, be necessary.

4. Authorised disposal of low level waste on site

There are a number of scenarios in which it may be appropriate for LLW to be disposed of on the site from which it was originally excavated. On-site disposals may involve:

- the deposit of soil or spoil containing levels of activity that make it radioactive within the meaning of RSA93, into specially prepared cells on the site from which it was excavated;
- the return of soil or spoil containing levels of activity that make it radioactive within the meaning of the Act, to the location from which it was excavated, having undergone some form of ex-situ treatment (e.g. segregation or immobilisation) used to break a significant pollution linkage; or
- a combination of the above.

It might also be the case that the capping of an area of land containing radioactive substances (to reduce, for example, an airborne radiological risk) is interpreted as "burial" within the meaning of Section 47 of RSA93 and is, therefore, an on-site disposal activity.

In all cases it will have been necessary to break the significant pollution linkage(s).

Existing Government policy and guidance only makes passing reference to the option of on-site disposal. The 1982 guide to the Radioactive Substances Act [5] suggests that "wastes of less than 0.4 Bq/g may be left on site and if significant economic savings can be made, this limit may be raised to 1 Bq/g. Burial of wastes with higher specific activity on the site at which they arise should only be authorised in special circumstances". Of course, the Substances of Low Activity (SoLA) exemption order (made in 1986) has formally excluded wastes of less than 0.4 Bq/g from the provisions of Section 13 of RSA93.

Cm 2919 [2] provides even less information on the subject, simply stating that authorisations may be issued for the burial of some LLW "... at the site where the waste was produced" and that where this is to be done, "the ground must have good containment characteristics".

The Environment Agency's internal guidance to inspectors on authorising disposals from non-nuclear premises (issued in 2000) does not make any reference to on-site disposals (only to controlled burial at landfill sites).

Whilst it appears from the above that Governmental policy does not promote the on-site disposal of LLW, it is not apparent whether, at the time it was formulated, the policy was intended to apply to the on-site disposal of contaminated soil or spoil where a risk based approach was being adopted (i.e. it results in a reduction in the risk of harm or pollution of controlled waters posed by those substances). It is suggested that the Government's policy on on-site disposal needs to be re-thought and re-issued in the light of its potential application to the remediation of RCL. Disposal on site is certainly an option used on occasion for addressing conventional land contamination (subject to being granted a waste management licence for the on site disposal). However, its application has been limited by the fact that many landowners prefer a 'final' solution (free of possible blight) and is generally only found associated with large remediation and redevelopment schemes.

It is likely that the Environment Agency would consult the relevant local authority when determining any application for an authorisation under Section 13(1) of RSA93 to dispose of LLW soil or spoil on the site from which it was excavated. However, it is not apparent (from the available guidance) whether the Agency would also consult the public. If the Agency considers that public consultation is appropriate (and this may be influenced by the size and nature of the scheme), then this may reduce the likelihood of the disposal option being used (due to blight issues).

If on-site disposal is to be encouraged as a potentially viable option for the disposal of LLW arising from the remediation of RCL, it is suggested that suitable guidance be prepared on determining whether the risks posed by such disposals are acceptable. Clearly, the disposal will, in any case, need to represent the best practicable techniques by which to break the significant pollutant linkage(s).

5. Disposal as very low level waste

Radioactive waste that is VLLW may be disposed as with ordinary refuse (occasionally referred to as "dustbin disposal") under the conditions of an authorisation granted under section 13(1) of RSA93 [5, 6].

The authorisation to dispose of radioactive waste as VLLW is granted to the operator of the premises on which the waste is created. The standard conditions of authorisation include the activities of waste that may be disposed of via this route and, where the refuse is collected from the premises by a private waste contractor, specify the landfill site to which the waste is to be disposed.

The disposal of radioactive waste as VLLW with ordinary refuse is included in most authorisations granted to non-nuclear premises in England and Wales (as well as a small number of nuclear licensed sites). The acceptability of the disposal of radioactive waste as VLLW with ordinary refuse was last reviewed in 1994/1995. The review concluded that the standard conditions of authorisation provide adequate protection of waste management workers and the general public and should not be altered [6]. The VLLW disposal route is expected to continue to be available to non-nuclear premises applying for new authorisations or variations to existing authorisations.

The usefulness of the VLLW route for the disposal of wastes arising from the remediation of RCL is, however, questionable on account of the quantities and types of radionuclide as discussed below.

The 1982 Guidance, *Cm 2919* and the Environment Agency's own internal guidance all state that authorisation for disposal as VLLW is suitable for "small amounts" or "small quantities" of radioactive waste. There is however, no further guidance on what is meant by "small". The annual limit on the volume of VLLW that may be disposed of from Amersham plc, Cardiff is 200m³, whilst ash and spent carbon/lime from incinerators that handle radioactive wastes from medical establishments (perhaps 1000m³ of ash and spent lime /carbon per incinerator) is also disposed of as VLLW.

The standard conditions of authorisation only specify that levels of activity in waste should not exceed 400 kBq in any 0.1 m³ and that no individual item within the waste shall exceed 40 kBq. They do not specify how many cubic metres of waste may be disposed of at any one time. Further work would need to be done to establish whether it will be acceptable (on radiological grounds) to dispose of large volumes of radioactive waste arising from the remediation of RCL as VLLW.

A second reason why this route is likely to be of limited value is that VLLW is usually restricted to wastes containing only beta and gamma emitting radionuclides. The majority of activities likely to have caused land to be radioactively contaminated involved the use of uranium, thorium and radium [7], the decay chains of which comprise predominantly alpha emitting radionuclides.

In conclusion, it is not clear whether there are constraints on the volumes of radioactive waste that may be disposed of as VLLW. However, in reality, it may be the limitation of the application of this disposal option to wastes containing beta/gamma emitting radionuclides only that constrains its use for wastes arising from RCL.

6. Disposal at the national low level waste disposal facility at Drigg

BNFL is currently authorised to dispose of solid LLW at its LLW disposal facility at Drigg. This is the only major facility designated for the disposal of LLW in the UK. As noted in section 3, because the disposal capacity at Drigg is limited, BNFL does not accept wastes for which there are practicable alternative disposal options (e.g. controlled burial in landfill).

Among other things, the Conditions for Acceptance specify the substances and types of substance that must not be contained in LLW that is to be disposed of at Drigg. A number of these substances could be found in wastes arising from the remediation of contaminated land (such as putrescible materials, free liquids, complexing agents, and substances with other dangerous properties (oxidising, flammable etc.)). However, it may be possible to treat the waste prior to its disposal to Drigg to remove these substances or reduce their hazardous nature (incineration, addition of cement, etc).

The total amount of LLW that Drigg can accept is limited in practice by its radiological capacity rather than its volumetric capacity. BNFL and the HSE estimate that the facility's radiological capacity will be exhausted by about 2050 [10]. BNFL has informed the Environment Agency that the current remaining volumetric capacity at Drigg is 200,000 m³ but that there are plans to build an additional capacity of 750,000 m³ (*pers. comm.* I. Streatfield, Environment Agency, 2002). The following assessment is based on the assumption that the total future volumetric disposal capacity at Drigg is 950,000 m³.

It is very difficult (if not impossible) to estimate with any confidence, the amount of LLW likely to be generated as a result of the RCL regime. However, attempts have been made to assess the potential impact of the regime on the remaining capacity at Drigg.

A preliminary analysis carried out, based on [7], suggests that approximately 500 sites in the UK were used to undertake activities with the potential to contaminate land with radioactive substances to levels that may pose a risk. If 10% of these sites were identified as RCL within the meaning of Part IIA of EPA90 and that on average, each of these sites produced 100 m³ of LLW, then approximately 5,000 m³ of LLW would be generated as a result of the RCL regime (i.e. approximately 0.5% of the future volumetric disposal capacity of Drigg).

The question that arises is whether the average volume could be much greater than 100 m³ per site. Environment Agency records of transfers of radioactively contaminated soil and rubble from ten premises made between 1998 and 2002 vary in volume from 0.2 to 58m³ (*pers. comm.* D. Bennett, Environment Agency 2002) which provides some indication of experience. Moreover, cost is also a significant factor. The cost of disposing of *Uncompactable LLW* to Drigg is currently between £1,500 and £2,000 per cubic metre. So disposal of say 1000 m³ from a site would cost £1.5-2 million in disposal costs alone. The costs of ex-situ remediation processes that result in the reduction of volumes of conventional contaminated soil/spoil (e.g. soil washing,

chemical leaching and detector based segregation) are of the order of £20 to £250 per tonne [11], suggesting that there will be a strong financial pressure for volume reduction where technically achievable (even if costs of ex situ remediation processes are significantly more expensive for radioactively contaminated spoil). Clearly, these disposal costs also encourage the identification of alternative disposal routes (e.g. on site disposal or controlled burial and landfill were it available).

For this reason, it is suggested that it is unlikely that there will be many disposals of LLW to Drigg of greater than 100 m³ per RCL site. The limited available data for the disposals to Drigg appear to support this hypothesis.

Many of the historic activities that may have resulted in the contamination of land with radioactive substances involved the use of radium and thorium [7]. The Drigg authorisation imposes an annual limit of 0.03 TBq on the ²²⁶Ra/²³²Th activity of waste that may be disposed of to the facility (*pers. comm.* I Streatfield, Environment Agency, 2002) and it may be this (radiological) limit that restricts the facility's overall capacity. A simple assessment has been undertaken to try to determine whether the waste arising from the remediation of RCL caused by these activities could have a significant impact on the remaining radiological capacity at Drigg.

It is not straightforward to estimate the likely levels of radioactivity in land that may be identified as RCL and no attempt has been made in this study to do so. Instead, the impact of the RCL regime on the available radiological capacity at Drigg has been considered in terms specific scenarios.

The disposed volume may be assumed to be 5,000 m³ as discussed above. Two different ²²⁶Ra/²³²Th combined activity concentrations have been assumed: (a) 10 Bq/g; and (b) 100 Bq/g.

The activity concentrations of radioactively contaminated soils and rubble transferred to Drigg during the period 1998 to 2002 varied from 4 Bq/g to 42 Bq/g (*pers. comm.* D Bennett, Environment Agency, 2002). This appears to support the use of this range of activity concentrations. For comparison, waste containing (only) ²²⁶Ra at levels below 4.9 Bq/g or (only) ²³²Th at levels below 7.4 Bq/g, is excluded from the provisions of section 13 of RSA93 by the Phosphatic Substances, Rare Earth, etc Exemption Order.

For scenario (a), the disposal would utilise between 5% and 10% of the remaining radiological capacity; and for scenario (b) between 50% and 100% of the capacity. Clearly, the actual volume of waste arising from remediation of RCL is also a considerable uncertainty although it is considered that the costs are such that 5000 m³ is unlikely to be a significant under-estimate (and could be a significant over-estimate).

In conclusion, it appears that the proposed RCL regime will not have a significant impact on the remaining volumetric capacity of the disposal facility at Drigg. However, disposals of radium-226 and thorium-232 containing wastes could have a significant impact on the remaining radiological capacity at Drigg. Further work will be required on the number of sites likely to be identified as RCL and the possible radiological composition, before more reliable predictions can be made.

7. Disposal at a new national facility

An alternative option for the disposal of waste arising from the remediation of RCL may be disposal at a new national disposal facility. However, the approximations of volumes of LLW likely to arise as a result of the RCL regime (of order 5000 m³ as set out above), suggest that the establishment of a facility to cater solely for the disposal of LLW arising from RCL would be inappropriate. Instead, it is suggested that one or more new facilities could be established for the purpose of disposing of a range of wastes that arise in high volumes but have a relatively low radioactive content (i.e. less active LLW).

Examples of other high volume less active LLW that might also be disposed of to such facilities include contaminated land waste arising from nuclear licensed sites and decommissioning wastes such as rubble, concrete, structural steel work etc. The suggested disposal facilities would be designed to be “fit for purpose”, taking into account the risks associated with these types of waste. It is suggested that this would be an efficient and cost effective means of dealing with the large volumes of less active LLW likely to arise over the next couple of centuries.

The other issue affecting the establishment of a new facility for the disposal of high volumes of less active LLW (arising from the RCL regime or elsewhere) is that of public acceptance. RSA93 provides the Government with the powers to establish a new facility; however, it seems presently unlikely to use them. Nirex’ experience in not succeeding in obtaining planning permission for a proposed Rock Characterisation Facility (in preparation for a repository for ILW and some LLW not suitable for disposal at Drigg) suggests that any proposal for such a facility may experience difficulties in gaining planning permission if its need is not widely understood and accepted by the public.

Future options for the disposal (or management) of radioactive wastes, including the replacement of the national disposal facility at Drigg are to be considered in the Government’s decision-making programme for the management of solid radioactive waste. The disposal of LLW waste arising from the remediation of RCL (and, it is suggested, radioactive land contamination on nuclear licensed sites) should be considered as part of this programme.

Thus, it is argued that the use of a new national facility for the disposal of LLW arising from the RCL regime cannot be considered in isolation from the disposal of other radioactive wastes and must be in-line with the widely agreed policy and practice arising from the above programme. Only through its inclusion in the Government’s programme and gaining public acceptance via this route will it be possible to establish a national facility for the disposal LLW, including that from the remediation of RCL.

However, as stated above, the Government’s proposed decision-making programme is timetabled to be complete by 2007. It is then likely to be several more years (perhaps a decade) before any new facility (or facilities) would become available for use.

8. Conclusions

The principal conclusions from this study are as follows:

- i. There is likely to be a continuing availability problem with respect to disposal of high volume low activity LLW at landfills, apparently due to perceived adverse publicity associated with the consultation process for authorisation and uncertainty over future liabilities. The Government's decision-making programme for managing solid radioactive wastes in the UK may ultimately achieve a general consensus that the use of landfill for these types of waste has a fundamental role to play. However, this is unlikely to change the situation within the next few years;
- ii. Authorised on-site disposal has had little attention in policy and guidance in recent years but nevertheless may have a part to play, especially if considered commercially attractive. Any on site disposal would need to represent the "best practicable technique" for breaking the pollutant linkage;
- iii. Disposal of waste from RCL remediation as VLLW is limited both by questions over volumes that may be acceptable and, more fundamentally, by the likely alpha activity of wastes (originating frequently from radium and thorium operations);
- iv. Disposal at Drigg is presently limited to wastes for which there are practical alternative disposal options and preference has been given to operational type wastes rather than decommissioning wastes (due to the finite nature of the facility). Illustrative calculations based on possible volumes and activities of arisings (and assuming Drigg's future volumetric disposal capacity is 950,000 m³), suggest that wastes arising from implementing the RCL regime if disposed to Drigg would not represent a significant fraction of the volumetric capacity but could have a significant impact on the radiological capacity with respect to ²²⁶Ra plus ²³²Th;
- v. A new national facility arising from the Government's decision-making programme for the management of solid radioactive waste appears unlikely to be available during the first decade of the operation of a new RCL regime. A dedicated facility for the disposal of LLW arising from the remediation of RCL sites alone would be unlikely to be economically viable. Consequently, it appears that Drigg will need to play an important role for some years to come.

The above Paper expresses the views of the authors which are not necessarily those of the organisations represented on the Radioactively Contaminated Land Steering Group set up by Defra

References

- [1] The Radioactive Waste Management Advisory Committee March 2003 *Advice to Ministers on Management of Low Activity Solid Radioactive Wastes Within the United Kingdom*, Defra, ISBN 0-85521-019-2
- [2] Secretary of State for the Environment et al. 1995 *Review of Radioactive Waste Management Policy – Final Conclusions* Cm 2919, London, HMSO
- [3] Department for Environment, Food and Rural Affairs et al. 2002 *Managing Radioactive Waste Safely – Summary of Responses to the Consultation September 2001 – March 2002*, London, Defra
- [4] Department for Environment, Food and Rural Affairs et al, 2001 *Managing Radioactive Waste Safely – Proposals for Developing a Policy for Managing Solid Radioactive Waste in the UK*, London, Defra
- [5] Department of the Environment et al. 1982, *Radioactive Substances Act 1960 – A Guide to the Administration of the Act*, London, HMSO
- [6] RFCG Non-nuclear Sub-group, 2000. *Work Instruction for Non Nuclear Handbook: Authorisation*, Environment Agency Internal Publication
- [7] Wakerley Dr M., 2000, *Historic Practices in the UK which have Utilised Radioactive Materials* DETR/RAS/00.005, London, DETR
- [8] BNFL Waste Management and Decommissioning 1999 *Conditions for Acceptance by BNFL of Radioactive Waste for Disposal at Drigg*, BNFL Waste Management and Decommissioning, Sellafield
- [9] BNFL Waste Management and Decommissioning 1999 *Guidance Note to the Conditions for Acceptance by BNFL of Radioactive Waste for Disposal at Drigg*, BNFL Waste Management and Decommissioning, Sellafield
- [10] Environment Agency 2002 *Guidance on the Characterisation and Remediation of Radioactively Contaminated Land*, Environment Agency, Bristol
- [11] Entec UK Ltd and NRPB 1999 *Technical Support Materials for the Regulation of Radioactively Contaminated Land* (Research and Development Technical Report P307), Environment Agency, Bristol