A PUBLIC CONSULTATION ON POLICY FOR THE LONG TERM MANAGEMENT OF SOLID LOW LEVEL RADIOACTIVE WASTE IN THE UNITED KINGDOM

Response from Quintessa Limited

Department for Environment, Food and Rural Affairs
Department of Trade and Industry
Scottish Executive
Welsh Assembly Government

31 May 2006

Northern Ireland: Department of the Environment

Quintessa

www.quintessa.org
Q1: Given that future arisings of LLW will exceed currently available capacity, do you agree that a change in LLW management policy is necessary? Have we identified the correct guiding principles for such change: flexibility of approach; use of a risk-informed approach to ensure safety; and additional emphasis on minimisation of arisings. (see Chapter 2, para 14; Chapter 3 paras 3, 10-16)

Response 1:
It is clear that action is required to address the current LLW 'capacity gap', especially if the NDA wishes to accelerate decommissioning. The guiding principles are sound but have not been considered holistically within the proposed strategy.

A key issue not highlighted in the consultation document is the potential knock-on effects of insufficient LLW capacity. Not only could this delay planned decommissioning activities, but it could also affect operation of existing facilities and care and maintenance of legacy facilities. This could potentially generate new liabilities and hazards far more significant than LLW.

In order to achieve the objectives set out in the consultation document we believe that two key actions are required:

1. A BPEO assessment to determine the national LLW management strategy. This should consider all different options and balance doses, risks, transport, local opinions, costs, environmental impact, etc.

2. Re-evaluation of the definition of LLW and hence the quantity of material requiring disposal.

These points are considered in more detail in the following text.
1. National BPEO

It is agreed that a more flexible, risk-informed, waste management approach has the potential to help address the capacity gap. However, it is not clear from the consultation who is responsible for implementing the risk-informed approaches to LLW management. A national BPEO assessment would develop a national strategy that would set a risk informed framework for LLW management.

It is clear that in the short-term the more flexible strategy is reliant on the continued availability of LLWR near Drigg to receive higher activity LLW. However, the policy document states that the LLWR near Drigg may not be available beyond 2007.

The safety case for the LLWR makes assumptions regarding the future waste inventory. For a number of radionuclides and potential exposure pathways the risk target of 1E-06 per year is exceeded. The proposed changes to the LLW management policy will tend to the increase the total activity consigned to the LLWR, and hence further increase risks.

The national BPEO assessment proposed would provide a mechanism to facilitate the best overall national option to be identified. It may be that continued disposals to the LLWR near Drigg would be shown to be in the national best interest i.e. the BPEO, even allowing for the current assessments of site impacts. If local site impacts are assessed to be As Low As Reasonably Achievable (ALARA) through an engineering optimisation programme, and this is also the national ALARA option, this would provide the context required within which the regulators could allow continued disposals.

To achieve effective decisions the regulators need to be involved in or at least consulted upon the national BPEO, development of the LLW management strategy and repository ‘concepts’ for different wastes at an early stage, otherwise there may be a lack of integration between waste policy and regulation. Such a lack of integration already exists - the key example is that of the Landfill Regulations, which ban co-disposal of radioactive (non-controlled) and controlled wastes. This causes problems with VLLW disposal and with disposal of exempted waste in Scotland, which is viewed by SEPA as radioactive waste. Additionally the policy has been implemented in practice by banning the use of Controlled Burials at hazardous waste landfill sites as the radioactive waste is not classified as being hazardous.

Quintessa are already involved in work to address site management, end point, safety case and regulatory issues at the LLWR near Drigg. A national BPEO assessment and changes to the LLW management strategy should maintain links to this work.

The total volumetric LLW inventory requiring disposal is clearly going to
be related to site end point strategies. In particular with regards to the treatment of contaminated land. There may be conflicts between some types of end point and waste minimisation. For example, achieving greenfield status maximises the volumes of waste to be dealt with.

The data currently available indicates that the contaminated land inventory is dominated by Sellafield and to a lesser extent Aldermaston, Drigg and Hunterston. It is clear that the LLW capacity gap, and hence the LLW management strategy will be very significantly influenced by the Sellafield site end point and management of the contaminated land. Therefore an early decision on the Sellafield site end point and contaminated land management strategy is required. Note the estimated volume of LLW contaminated land at Sellafield is 1.8 million cubic metres not 18 million metres cubed as stated in the consultation.

2. Definition of LWW

See response to Q11.

Q2: Have we identified the correct requirements for the production of LLW management plans? (see Chapter 3, paras 9-10)

Response 2:
It is clear that addressing the LLW capacity gap will require long-term thinking and planning, for example due to the time required to develop new repositories and open up new disposal routes, e.g. VLLW to landfill sites. Development of LLW management plans will inform this thinking and help ensure that sufficient capacity is available.

Clearly it would make sense to have a national strategy for the location and timing of new repositories developed against these management plans to ensure that waste disposal routes are optimised and capacity ‘bottle necks’ do not develop in the future. Leaving waste disposal routes open to market forces is unlikely to result in an optimised waste management strategy. Even with significant changes to the planning process it is unlikely that a system based on market forces alone could respond sufficiently quickly. This will result in capacity bottle necks and the need for increased waste transport.

In straightforward terms the flow of information should be as follows:

1. Specification of LCBLs for individual sites / plants, in tandem with derivation of Site End State
2. Site waste management options (inc. local BPM) (VLLW/LLW/ILW/HLW)
3. Development of site LLW management plan options (inc. local BPM)
4. National BPEO
5. National LLW framework
6. Definition of site LLW management plan, i.e. option selection
7. BPEO / BPM for local facilities

In reality there may be more iterations than indicated above. A waste management strategy will be required while a national BPEO is being undertaken.

At the SAFESPUR LLW Policy Workshop held on 11/5/06, DEFRA noted that they do not want the absence of LLW disposal facilities to hold up decommissioning work. However, the policy also requires an assessment of operational and post-closure risks for a planned disposal route. This could prove difficult for a facility that doesn't exist and can encourage continuation of the present day situation where operators are steered in the direction of using the LLWR near Drigg by the standard site licence condition which states that operators "must use available disposal routes".

The need to include operational and post-closure safety cases for intended disposal facilities in the justification for LLW management decisions could prove to be difficult in practice where the proposed disposal site is owned and operated by a different company to the waste consigner. Clearly there will need to a licence / authorisation requirement for the disposal facility operator to make appropriate safety case information available to SLCs in a standard format. This process will be simple if a national BPEO has been undertaken to develop a LLW management framework and hence specify the facilities required.

The main issue here is the requirement to revisit regulatory approaches and guidance with the above in mind.

The consultation document states that management plans should be based on a presumption towards early solutions. However, the consultation document also states that waste should be minimised by options including decay storage (Chapter 3 paragraphs 10 and 15). Clarification is required.

Will LLW management plans be required to consider contaminated land? It is assumed that LLW management plans will have to be produced for contaminated land which is regarded as waste by the HSE (NII). These plans will have to be linked to the site end point and contaminated land management strategy in order to estimate future capacity requirements and facilitate long term planning.

Q3: Is use of the waste hierarchy as defined, the right way of securing LLW minimisation? (see Chapter 3, paras 15-16)

Response 3:
The waste management hierarchy contains the correct steps necessary to minimise volumes of LLW. However, the hierarchy is only a statement of best practice. There is no mechanism by which to audit waste
producers, or hold them accountable against the hierarchy. The proposed LLW management plans may provide the correct vehicle to achieve this.

Although the waste management hierarchy contains the correct steps to minimise volumes of LLW, the hierarchy should not be inflexible because waste minimisation can have a number of negative effects:

1. As waste volume is decreased the specific activity of the waste is increased. This can affect the disposal routes that are available and will tend to increase the total activity sent to the LLWR near Drigg. Potentially the volume of waste that needs to be sent to the LLWR could actually be increased.

2. Increased waste handling, segregation and recycling will tend to increase worker doses and generate secondary wastes. There will be a point where the benefits of volume reduction, segregation, recycling, etc are outweighed by the negative impacts. Of particular note is the fact that doses acceptable to nuclear workers are far greater than the dose target for LLW repositories. There needs to be a balance of doses.

In the response to Q2, the steps required to develop LLW management plans were specified. Under stage 3, each site should define their LLW waste volumes and characteristics. A number of LLW management options should be developed, taking into account generation of secondary wastes, worker doses, etc. This information can then be fed into the national BPEO and development of the national LLW framework. Each site can then define its LLW management plan against the national framework. The BPEO/BPM for individual local waste facilities can then be defined.

Q4: Is best use being made of incineration of combustible LLW, for the minimisation of waste? If no, what are the obstacles for greater use of incineration? (see Chapter 2, para 9; Chapter 3, para 15)

Response 4:
Incineration is a valuable volume reduction process that is currently under utilised. It should be noted that incineration increases the specific activity of the waste, which can result in the negative impacts described under the response to Q3.

Q5: Should the proximity and minimisation of transport principles apply to the management of LLW of different kinds? If yes, do you have any observations on the way they should be applied? (see Chapter 3, paras 21-22)

Response 5:
The proximity and minimisation of transport principals should apply to the management of LLW of different kinds. However, minimisation of
transport is just one attribute in selection of the BPEO.

Given that the bulk volume of LLW is produced by the nuclear industry, the greatest reduction in transport will be achieved if new disposal routes are located close to these sites. Clearly such routes are unlikely to be available in the short-term due to planning and licensing issues.

In our responses to Q6, 7, 9, 10 and 13 we argue that in general it is not likely to be viable or optimal for non-nuclear industry LLW producers to establish their own disposal routes for higher activity LLW (although this would need to be confirmed by a national BPEO assessment). An optimum solution could involve regional LLW repositories. These would be located at the nuclear sites since they are the major waste producers. The sites would be available to non-nuclear waste producers including hospitals, etc.

It should be noted that the majority of UK nuclear sites are located on the coast and many are vulnerable to coastal erosion. This is likely to be a significant issue for long-term safety cases, indicating that in some regions the LLW repository would have to be located further inland on a separate site. This would no doubt be more difficult to obtain planning permission for than development on an existing nuclear licensed site.

Q6: Should the NDA also provide facilities for the disposal of non-nuclear industry LLW, where this is possible in conjunction with its main work on civil nuclear decommissioning and clean-up? (see Chapter 3, paras 26, 29)

Response 6:
Higher activity LLW requires repositories with complex and expensive engineering, waste handling and safety cases. Clearly it is not sensible for small volume non-nuclear industry producers of LLW (as opposed to VLLW) to develop such facilities. This leaves two options.

1. NDA facilities are made available to non-nuclear industry LLW producers.

2. Waste management companies operate waste repositories and offer commercial services to LLW producers to collect and dispose of their waste.

Option 2 is not likely to generate the BPEO. It is unlikely that any given region of the country will require more than one LLW repository for non-nuclear industry waste. Therefore there will not be any local competition such that the cost of waste disposal may become artificially high. Potentially transport of waste will be increased as waste producers seek out lower cost disposal routes in other regions of the country.

Overall it is considered to be most sensible for non-nuclear industry LLW producers to use NDA facilities.
**Q7:** What should be the relative roles of national or regionalised facilities vis-à-vis local management schemes for LLW, and how might these depend on the nature and activity of the waste in question (for example, in considering transport impacts)?  (see Chapter 3, paras 21-22; 27-28, 30-34)

**Response 7:**
In our response to Q6 we identified that the NDA should provide facilities for the disposal of more active LLW to non-nuclear industry producers.

For less active LLW and VLLW, local management schemes are more viable. A number of actions are required to ensure the continued availability of existing routes and the ease of developing new routes:

1. Clear statement of who is responsible for developing such routes.
2. Integration of waste criteria with the landfill regulations to overcome issues that are currently preventing LLW and VLLW from going to conventional landfills.
3. Involvement of the regulators at an early stage.
4. Improvements to the planning system to support the development of new disposal routes.
5. Improved education of the public to ensure support for new disposal routes.

The benefit in providing the means by which to establish new local management schemes will be dependent on the volumes of waste under consideration, and whether the required investment outweighs the benefit of simply using NDA facilities. For example, if the waste volumes are small then establishing new local schemes will not be worthwhile because the costs of doing so under the existing planning and waste management regimes will be disproportionate to the benefits. Making changes to the regimes in order to address the issues will also be disproportionately expensive.

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<th><strong>Q8:</strong></th>
<th>Is the availability of disposal routes for disposal of non-nuclear industry LLW diminishing? If so, please provide specific examples of difficulties and their consequences on operation of relevant industries. What steps can you suggest to address these problems?  (see Chapter 2, para 9; Chapter 3, paras 30-34)</th>
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<td><strong>Response 8:</strong></td>
<td>This is not our primary area of expertise. We leave it to others to comment.</td>
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<th><strong>Q9:</strong></th>
<th>Is it right in principle that local communities should take greater responsibility for the disposal of non-nuclear industry LLW arising from producers serving their communities, for example, hospitals and research and</th>
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educational organisations? (see Chapter 3, paras 31-32)

**Response 9:**
In principal this is considered to be reasonable. An onus on local communities to manage their own waste will tend to drive communities to find solutions for their own waste and develop new disposal routes. This will likely overcome many of the planning and stakeholder objections when facilities are proposed by the public sector to serve national requirements. However it should be noted that many hospitals, research and educational organisation provide national and international services. For example the benefits of research undertaken at a given educational establishment may not directly benefit the local community. It will be difficult to put the onus for waste management on local communities in such situations.

As described in our response to Q7, we believe that this should only apply to less active LLW and VLLW. NDA sites should receive more active LLW from non-nuclear industry producers.

There is a need to produce simpler risk information for the general public, with examples and context. Without this they may find it hard to make informed judgements about the acceptability of proposed LLW management options.

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**Q10:** What role should national, regional and local planning strategies play in relation to the provision of facilities to dispose of such LLW (landfill and incinerators), particularly that at the lower end of the LLW activity range? (see Chapter 3, para 32)

**Response 10:**
This issue has been discussed in our responses to Q6, 7 and 9. As stated previously, a national BPEO assessment would help determine the requirement for national, regional and local facilities. This national statement would help develop planning strategies.

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**Q11:** Do you support the proposed redefinition of VLLW to make it compatible with the wider definition of LLW? If not, why? (see Chapter 2, paras 12-13; Chapter 4, para 4)

**Response 11:**
It is believed that the upper activity limit for LLW was derived in the early 1960s based on a very simple calculation specific to the LLWR near Drigg. The calculation assumed that leachate from the waste trenches was drained into the adjacent Drigg stream. A cow then drank water from the stream resulting in exposure to humans via the consumption of milk. This was obviously a very simple site specific assessment and would not meet current day best practice requirements for a risk assessment model.
The 2002 PCSC for the LLWR near Drigg included a far more detailed and comprehensive risk assessment. The calculated potential risks were significantly greater than the risk target of $1E-6$ per year. Peak risks were generally associated with the historic waste disposal trenches where the activity limit for disposals had been specified on the basis of the calculation undertaken in the early 1960s. The basic issue is that the site specific LLWR disposal activity limit was not calculated for the most conservative exposure pathway.

This indicates the dangers in applying generic waste criteria to different disposal sites across the country. Ideally, disposal limits should be site specific, taking into account the site specific waste stream fingerprints and proposed waste volumes; for example the total quantities of long and short half-life radionuclides. Site specific activity limits are particularly desirable for sites only taking higher activity LLW.

It is agreed that for pragmatic reasons generic activity limits may be required as opposed to site specific limits; in particular for VLLW and exempted wastes. It is recommended that three actions are undertaken:

1. Radionuclide specific generic activity limits should be defined on the basis of generic facility models, for example a landfill site taking VLLW, a near surface concrete monolith vault in a coastal location, and a medium depth facility located in an inland hillside. This approach would be broadly comparable with that used in CLEA and RCLEA to calculate acceptable soil contaminant concentrations.

2. The results of the above assessment should be compared with the national radioactive waste inventory and waste fingerprints to identify the types and numbers of facilities which would be required against various activity criteria. Activity limits could then be defined within a national BPEO assessment for management of LLW. This approach would also enable the waste fingerprints of different producers to be analysed and decisions made regarding transport Vs local or regional facilities to be optimised.

3. VLLW and exempted waste activity limits should be redefined on the basis of the generic landfill model. This model should be used to facilitate the development of new disposal routes to conventional landfills for non-nuclear industry producers to avoid the need for detailed, highly expensive, site specific safety cases.

It is noted that the proposed definition of VLLW includes higher concentration limits for H-3 and C-14. It is potentially anomalous that such exemptions are not applied to the LLW activity limit. It is understood that this has created waste disposal issues for GE Healthcare, resulting in wastes with no disposal route.

The proposed definition of VLLW does not consider alpha activity. It is
understood from feedback at the SAFESPUR workshop that this is still under consideration. Clearly an activity limit of zero will not be acceptable. Neither will not specifying an activity limit.

Q12: Do you believe that we have identified the correct options to be considered for the disposal of LLW, subject to the preparation of plans and safety cases that are acceptable to the regulators? (see Chapter 4, para 12)

Response 12:
The options identified for disposal of LLW are generally sensible. However, for some waste streams, in particular those containing significant quantities of long-lived radionuclides, near-surface disposal may never be appropriate.

Peak assessment risks in the 2002 PCSC for the LLWR near Drigg were generally due to U-234, which was disposed in the form of waste Uranium ore from Springfields, and other long-lived radionuclides. These very long-lived radionuclides can result in unacceptable risks due to human intrusion into the facility or gross disruption of the facility for periods of tens of thousands to hundreds of thousands of years. The probability of human intrusion or gross disruption of a near-surface site is high over these time scales. Engineering measures can not be relied up for more than a few hundred to a few thousand years at most. Therefore for some waste streams currently classified as LLW, deeper disposal is the only viable option if post-closure risks are to be below the regulatory risk targets (unless relevant regulatory approaches are reviewed such that the regulators are able to accept risks above the risk target through demonstrations of optimisation and ALARA, and compliance with CLEA/RCLEA levels of intervention requirements).

It is recommended that for management of these wastes there needs to be links with approaches recommended by CoRWM. There are a number of potential management options:

1. Temporary storage of long-lived LLW in near-surface repositories with the intent to retrieve it at a later date and co-dispose it with ILW and HLW.
2. Temporary storage with ILW.
3. Chemical processing to remove longer-lives radionuclides which can then be concentrated and disposed of as ILW. The remaining wastes can be disposed of as LLW / VLLW / exempted (depending on the process used and its efficiency).

Q13: Should such LLW facilities be available to all waste producers including those in nuclear and non-nuclear industries, such as hospitals, research and educational organisations, and the oil and gas industries? If not, what should be the nature of any exception and why? (see Chapter 4, paras 12-14)
Response 13:
As discussed previously, we believe that such LLW facilities should be made available to both nuclear and non-nuclear industries.

Any other comments:
Contractual arrangements:
Repository site operators will have relatively short-term contracts with the NDA/SLCs in comparison to the length of time that would be needed for authorisation and construction of new waste facilities. The inherent short-term thinking will drive a continuation of the present day situation i.e. an inefficient use of the LLWR near Drigg or other national facilities.
Potential solutions include:
1. A guaranteed operations contract for a given period to any company wishing to develop a new repository.
2. The NDA will own and develop new repositories in order to meet its decommissioning objectives. The NDA can then phase the contractual arrangements as it considers appropriate.

Respondent’s details – please enter below

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