Note of SAFESPUR Meeting

Challenges in Reducing the Burden on the UK's National Low Level Waste Repository

AMEC, Warrington, 29 April 2009

This meeting was chaired by Peter Booth of the National Nuclear Laboratory, who is currently on secondment to the Nuclear Directorate of the Health and Safety Executive. It was attended by about 35 people. In the morning there were five presentations, with Q&A opportunities. In the afternoon there were tours of the NIRAS laboratory complex operated by AMEC, to see work on analysis of environmental monitoring samples, waste characterisation and waste encapsulation.

Environmental Regulations for Radioactive Waste Management and Decommissioning
This first presentation was by Colin Hardman of the Environment Agency. He began by emphasising the need to minimise arisings of waste, through the use of "clean" technology and of "best practicable means" (BPM) or, equivalently, "best available techniques" (BAT). The Environment Agency expects each nuclear site to have an Integrated Waste Strategy, which has been developed by applying the waste hierarchy. For low level waste (LLW) the key requirement is to have a LLW Management Plan.

Routes available for LLW are:

- disposal at a landfill that does not have an authorisation under the Radioactive Substances Act (RSA) – for low volume very low level waste (VLLW) and small quantities of LLW ("controlled burial"); not for any VLLW from nuclear sites, which is classed as high volume VLLW
- disposal at a landfill that has an RSA authorisation for co-disposal of radioactive and non-radioactive wastes – there are no such landfills yet but the Environment Agency is expecting to receive three applications soon
- disposal at the Low Level Waste Repository (LLWR)
- incineration, with disposal of the resulting solid waste (ash)
- treatment in the UK (eg at the Studsvik UK Metals Recycling Facility), with recycling of product and disposal of waste
- treatment in another country, with recycling of product and disposal of waste.

In order to use any of these routes consignors must have an RSA authorisation to dispose of LLW on or from their sites. For significant LLW disposals, especially from nuclear sites, the Environment Agency expects the consignor to do optioneering and to identify the "best practicable environmental option" (BPEO), taking into account the proximity principle and the potential impact of climate change on long-term storage or disposal facilities. The landfill operators who apply for RSA authorisations should include radiological impact assessments. The Environment Agency will make proportionate use of the Guidance on Requirements for Authorisation (GRA)[1] when assessing the applications and regulating these landfills. It will aim to set annual upper mass or volume limits for each landfill, and may vary these limits over the lifetime of the landfill. It will not generally set conditions on the management of the LLW on the landfill site but will focus on the adequacy of management systems and of record keeping arrangements. The non-radioactive properties of LLW must be taken into account by the consignor and the landfill operator in their assessments.

The Environment Agency has produced a Guidance Note on disposal of LLW to landfill and a Q&A brief (both are on its website). It is consulting now on varying the RSA authorisations

[1] Environment Agency, Scottish Environment Protection Agency and Northern Ireland Environment Agency, 2009. Near-Surface Disposal Facilities on Land for Solid Radioactive Wastes. Guidance on Requirements for Authorisation.

for all nuclear sites in England and Wales to allow them to send metallic LLW to the Metals Recycling Facility and to allow them to send LLW to the LLWR for purposes other than disposal (eg onward transfer of combustible waste for incineration, onward transfer of metals for treatment and recycling). It sees benefits in opening up these routes for nuclear LLW and no increase in environmental risks.

A number of issues were raised in the Q&A session after the presentation and later in the morning. The main ones were as follows.

Who assesses compliance of LLW disposals with the proximity principle? Legally, it is for the landfill operator to carry out the assessment but the Environment Agency expects consignors to do much of the work. One difficulty is that at the time of application for an authorisation the landfill operator will not know all the consignors who may use the landfill over its lifetime. The Environment Agency may approach this by setting restrictive annual disposal limits initially, then relaxing these if and when it is appropriate to do so.

What will be the requirements for landfill aftercare and permit surrender? The requirements will be case-by-case and will be similar to those for landfills that do not accept LLW. Landfills will not be granted RSA authorisations if it appears that the presence of LLW in them would entail considerable additional aftercare. There may well be a need for extra monitoring to reassure the public.

To what extent should the Environment Agency consider economics when regulating LLW management? At present the Agency expects consignors to consider financial aspects when they carry out optioneering. Wider economic aspects are considered by Government in setting policy and strategy but are not part of regulation under RSA.

Current and Future Challenges in Disposing of LLW – the LLWR Perspective

The second presentation was by Chuck Conway, Head of Consignor Support at LLWR Ltd. He said that, when it considered LLW in its 2006 Strategy, the Nuclear Decommissioning Authority (NDA) identified two key challenges: to increase the capacity of the LLWR and to limit the amounts of waste being consigned to the LLWR. Delays in decommissioning have provided a breathing space to address both of these challenges.

The key to the capacity issue is the development of a revised Environmental Safety Case (ESC) for the LLWR, for submission to the regulators in 2011. If LLWR Ltd can gain regulatory approval of the ESC, and consignments of LLW for disposal can be substantially reduced, then the lifetime of the LLWR could be extended to 2070 or beyond. At present there is very little space in vault 8 of the LLWR for disposal. The first operational area in vault 9 will become available soon. Additional areas will be constructed and become operational in phases, eventually giving a 10 year capacity. However, this is for storage because vault 9 will not be authorised for disposal until regulators are satisfied with the ESC.

LLWR Ltd is making progress with producing the revised ESC. It has put in place a new project manager, team and work programme, and is liaising closely with the Environment Agency to ensure that the 2011 ESC will meet regulatory requirements. Radiological capacity is an issue in the ESC, as well as volumetric capacity. In due course, it may be necessary to change the conditions for acceptance at the LLWR to address radiological capacity issues. There is also a possibility that consignors are overstating the radionuclide content of their wastes and that part of the radiological capacity issue could be resolved by advising them to be less pessimistic.

The LLWR Ltd work for the NDA to develop a UK nuclear industry LLW strategy is also going well. The company has completed its preliminary strategic review and the LLW Management

Plan is on the website. The draft UK nuclear industry LLW strategy and the accompanying strategic environmental assessment report will be out for public consultation in summer 2009. The strategic review showed that, if consignors did nothing more to implement the waste hierarchy, then a second LLWR would be needed soon. In this situation the lifecycle cost of the existing and new LLWR would be almost £6 billion, of which about £3 billion would be currently "uncontracted liability," ie it would not be in the budgets of LLWR Ltd or consignors. The aim in the LLW strategy is to reduce the uncontracted liability to about £0.4 billion.

To assist consignors, LLWR Ltd has established a separate and larger consignor support team. It has extended the range of services it offers to consignors and these now include:

- supply, repair and inspection of LLW containers
- compaction of loose and drummed LLW
- treatment of metallic waste (starting in June 2009, using off-site contractors)
- treatment of combustible waste (using off-site contractors)
- LLW disposal
- VLLW disposal (via off-site contractors).

In the near future LLWR Ltd aims to extend treatment services, supply reusable containers and to offer additional consignor support services. Its objective is to be a "one-stop shop" for consignors, by becoming a broker between them and the supply chain.

Challenges in LLW Management – a Local Government Perspective

This presentation was by Fred Barker, the Executive Director of the Nuclear Legacy Advisory Forum (NuLeAF). NuLeAF is a Special Interest Group of the Local Government Association. 103 local authorities in England and Wales are members, including all the authorities with nuclear sites in their areas. NuLeAF has a number of current strategic objectives, of which two relate to LLW. One of these objectives is to ensure that the UK nuclear industry LLW strategy is developed and implemented in ways that can inspire local authority and public confidence. The other is to encourage the development of local or regional LLW management facilities at existing nuclear sites rather than at non-nuclear sites.

NuLeAF supports the preservation of LLW capacity, the rigorous application of the waste hierarchy and the opening up of new disposal routes. It sees siting of new LLW facilities as the crucial issue. It recognises that there are pros and cons associated with different siting options. On balance, however, and where practicable, it favours the development of new LLW facilities at or adjacent to existing nuclear sites. This is because:

- local authorities and the public are likely to have more confidence in nuclear site licensees to manage radioactive wastes than landfill operators
- there would be less transport of LLW
- such a strategy would not rely so heavily on the supply chain
- a substantial proportion of nuclear industry LLW could be dealt with in this way
- there would be greater consistency with the general trend away from sending waste to landfills.

NuLeAF recognises that for some sites the disadvantages of on-site disposal will outweigh the advantages, in particular where alternative uses for the site are being developed and where there are aspirations to move to early delicensing.

NuLeAF believes that the NDA should encourage its site licence companies to assess the potential for on-site disposal. Waste Planning Authorities may also wish to encourage the concentration of nuclear waste management at or adjacent to existing nuclear sites through their Minerals and Waste Development Frameworks. NuLeAF also believes it will be

important to give careful consideration to public acceptability when developing and implementing the nuclear industry LLW strategy.

The main issues arising and points made in Q&A were as follows.

Is there a qualitative difference between high volume VLLW and LLW as far as local government is concerned? NuLeAF recognises the difference, but there is a need for greater understanding within local government and the public. The radioactive nature of the wastes is probably more important to most people than numerical estimates of the risks they pose.

What are local authority views about Exemption Orders? NuLeAF is aware of the Exemption Order review but many of its members are not. It will brief its member authorities when formal consultation on the review takes place.

Consignors' BPEO studies do yet not consider the impacts on receiving sites and do not address the sustainability of VLLW disposal to landfill. The only formal 'sustainability appraisals' for disposals of radioactive wastes are at the national, strategic level. This is in contrast to non-radioactive wastes where sustainability is considered at local level, as part of communities taking responsibility for their wastes.

It is not always easy to distinguish between re-use, recycle and recovery and often the distinctions seem not to matter to most stakeholders.

Sustainable Practices Relating to Decommissioning of Concrete Structures and Current Issues in Storing Excavation and Demolition Wastes at Sellafield

Paul Kelly of Sellafield Ltd's Characterisation, Land Quality and Clearance (CLQ&C) Team gave this presentation. He has recently joined the SD:SPUR Project Steering Group and aims to raise the profile of SD:SPUR on the Sellafield site. He pointed out that the 2005 SD:SPUR Guidance is still relevant and valuable, not least because of the increased emphasis now given to the use of the waste hierarchy in decommissioning and waste management.

The CLQ&C Team offers services to others at Sellafield for waste characterisation, with the aim of facilitating more thorough assessment of re-use and recycle options, and of identifying appropriate disposal options if re-use/recycle is not possible. The Team's view is that it is not sustainable to dispose of the concrete generated by nuclear decommissioning. Concrete recycling is well-established outside the nuclear industry and should be adopted in decommissioning. The WRAP Quality Protocol for recycled aggregates gives clear guidance on the standards required of recycled concrete aggregate.

At Sellafield concrete is re-used on site and also sent off site for recycling. An example of re-use is the Calder Hall cooling towers. When the towers were demolished almost all the concrete was used to fill in their basins. Sellafield sends concrete to local facilities for recycling and accepts it back on site for use in new projects only if the WRAP Quality Protocol has been followed. It is encouraging the supply chain to adopt the protocol and is discussing recycling with the Environment Agency, local councils and other stakeholders. The CLQ&C Team works to encourage project designers and specifiers at Sellafield to use recycled concrete aggregate.

At present there are limited options on the Sellafield site for storage of excavation and demolition wastes. Most storage is in flexible intermediate bulk containers (FIBCs). The CLQ&C Team reviewed storage standards in 2008. They found that there are no standards documents for storage of radioactive wastes in FIBCs but they were able to identify industry best practice. Their findings will be implemented across the Sellafield site. The new

requirements will include the use of lined or bunded storage areas, covering FIBCs to protect them from the weather, labelling and inspection. There may also be a change to the use of UN "approved" FIBCs and to a single supplier.

There will be many more opportunities to re-use or recycle concrete as decommissioning at Sellafield moves forward. Considerable investigative work will be needed to maximise re-use and recycle, and there will be a need for crushing and other equipment, and for storage facilities for wastes and products. The CLQ&C Team encourages others on site to allow time for concrete characterisation and to plan during project development for segregation of clean waste, exempt waste and VLLW.

High Temperature Incineration and Waste-to-Energy Plants at the Pyros Fawley Site

The last presentation was by Chris Macey of Pyros Environmental Ltd, which owns the high temperature incinerator (HTI) and waste-to-energy fluidised bed incinerator at Fawley in Hampshire. The Fawley HTI is one of only two in the UK that can handle large volumes of very hazardous waste. It is used for solid, liquid and gaseous waste. It has a permit for 45,000 tonnes of waste per year and typically handles about 30,000 tonnes, of which about 1,000 tonnes is radioactive. Its output is non-hazardous waste and VLLW. The HTI consists of a rotary kiln, which operates at 1100-1200^{o}C, and an afterburner chamber, which operates at 1120-1150^{o}C. Its gas cleaning plant includes quenching (which prevents the formation of dioxins), scrubbing and electrostatic precipitation. The gaseous effluent is heated prior to discharge to make it less visible and there is continuous stack monitoring. The liquid effluent treatment plant includes chemical dosing, addition of flocculent and filtration. There is batch analysis before discharge to the estuary. The floc is pressed to dewater it and disposed to landfill.

The Pyros Fawley site is a top tier COMAH site, with a PPC permit and an RSA authorisation. Its RSA authorisation includes 90 day accumulation limits and monthly incineration limits for carbon-14, tritium, iodine-125, iodine-131, phosphorus-32, sulphur-35, other beta/gamma emitters and alpha emitters. There are also daily limits and package limits so that the radionuclide content of ash can be kept sufficiently low. Discharge levels are taken into account in setting the incineration limits and it is unnecessary to have limits on discharges per se. Pyros' conditions for acceptance of waste include criteria to ensure suitability for processing, as well as activity and external dose rate. The company is willing to discuss problematic wastes with customers with a view to accommodating them. NORM waste can be accepted for shredding provided it is within Exemption Order limits.

The fluidised bed incinerator with energy recovery was commissioned in 2002. It is licensed to deal with 60,000 tonnes of waste per year and exports 6 MW/hr to the national grid. The plant was commissioned with meat and bone meal. It is now being used for hazardous and non-hazardous wood, eg telegraph poles, railway sleepers and building supports. Pyros is discussing its use for VLLW with the Environment Agency. Ash can be re-used as aggregate at present but this might not be possible if the plant handled VLLW.

In Q&A the issue of *the detail of waste characterisation needed for incineration* was raised. The ideal is to obtain details of every radionuclide in every drum and the guidance is "look for everything". Consignors do most of the characterisation, using sampling and fingerprinting, and have to satisfy the regulator under the terms of their authorisations. Pyros scans drums but relies mainly on the information provided by consignors.

Chair's Summary

There was no time for a Chair's summary on the day so Peter Booth circulated the following summary afterwards.

"I would like to thank all the speakers and delegates who attended the workshop. A special thank you should go to AMEC for hosting the workshop and for conducting the laboratory and rig tours in the afternoon.

I hope everyone felt that the workshop provided an interesting insight into the challenges facing the UK's national LLW disposal facility. The tour in the afternoon highlighted the overall approach to sample preparation and analysis and, importantly, how quality assurance is maintained. I think those of us who consign samples to the laboratories will have gained a better appreciation of how the costs are derived.

The title and content of the workshop attempted to highlight that we work within an ever-developing regulatory framework and, despite recognition that there are some serious challenges facing both the consignors and waste receivers, there are solutions.

The key messages for me that came out of the workshop were as follows:

- Volumetric and radiological capacity challenges are not merely the problem of the disposal facility operators. It is imperative that the operator, consignors and regulators work together, taking cognisance of an increasingly interested stakeholder community.
- The Environment Agency highlighted some proposals for changing LLW authorisations and the associated benefits.
- The LLWR is working closely with regulators and consignors, and in particular with the Environment Agency to ensure delivery of the 2011 Environmental Safety Case.
- We were introduced to the term "uncontracted liability" and how this could be managed better.
- The local government and public perspective was to encourage the consideration of more on-site disposal of LLW/VLLW rather than within landfills or newly constructed/authorised sites. The pros and cons of such an approach were highlighted.
- At the Sellafield site there is a focus on the improved characterisation and re-use of concrete. There are many opportunities for such material to be re-used. The site is applying the waste hierarchy across a wide range of its operations.
- High temperature incineration is a successful method for the destruction of hazardous waste, including radioactive waste. The benefits and the high standards adhered to were highlighted."