Nuclear Free Local Authorities
RADIOACTIVE WASTE POLICY
Briefing on the Government Review

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Deep Geological Disposal: Is it the Solution?[†]

The Committee on Radioactive Waste Management (CoRWM) made a recommendation to Government supported by the overwhelming majority of its members that deep geological disposal is the best means of managing the UK's 500,000 cubic metres, 78 million terrabequerels of legacy radioactive waste.

There are issues around the way in which that recommendation was arrived at as well as concerns about deep geological disposal itself which need to be examined in order to put the recommendation in perspective.

Firstly, support for disposal among CoRWM members rested on varying degrees of confidence in the long term safety of the option. While all members bar one felt they could register 'sufficient' confidence in long term safety to recommend disposal, such support is clearly proportionate to the level of confidence generated after taking advice from expert bodies such as the Geological Society. Thus support for disposal among members of CoRWM was a mixed bag – I remained unconvinced by what I heard, others felt persuaded and others had their confidence reinforced - and stems from sincerely held views among CoRWM members about the degree of confidence in the long-term safety of disposal individually held. And, as CoRWM said in the report, such confidence as was expressed is based within the state of current knowledge – which in my view is not that far advanced.

Secondly, the recommendation for disposal came as part of a basket of interlocking and interdependent recommendations which essentially act as a default position should disposal be socially and environmentally unacceptable. CoRWM called for an R and D programme to reduce uncertainties in disposal and this links directly to the level of confidence in long term safety issue – confidence must be compromised to some degree by the requirement to reduce these uncertainties. And if we accept that these uncertainties are, indeed, significant enough to warrant an accelerated R and D programme, then should we not undertake that programme first before initiating an implementation programme for a repository? Even from a self-interested point of view, and in order to assist the search for a repository, it would be in government's interests to get this programme underway as soon as possible. It would have been far more useful and relevant to have launched a consultation not on implementation as we currently have but on the nature, length, focus and manner in which an R and D programme would be conducted.

[†] This paper was prepared by Pete Wilkinson, founder member of Greenpeace UK and Friends of the Earth, and a member of the Committee of Radioactive Waste Management. It is based on a presentation to a Nuclear Free Futures seminar hosted by Leeds City Council in June 2007.

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CoRWM also called for a security-led review of storage arrangements in the UK, again as a contingency against disposal being unacceptable to any community wishing to have its 'wellbeing' enhanced by hosting the digging of a hole five times the size of the Albert Hall into which would be placed half a million cubic metres of waste which remains dangerous for a million years. Storage will have to continue for at least 40 years regardless of whether or not disposal becomes a reality because even under the most favourable conditions, that is how long it will take to go through the process from identification of a host community to the beginning of waste emplacement. Today, 300 tonnes of spent PWR fuel sits at Sizewell representing a prime terrorist target and a lethal threat to the people of Suffolk and beyond. Spent fuel sits in ponds at other nuclear sites around the country. Security experts from whom CoRWM sought advice were unanimous in their view that such a post-9/11 review of security must take place.

So the disposal recommendation must sit within the context of the CoRWM set of wider recommendations and it is clear that, taken as a whole, disposal assumes a far less dominant role in terms of what CoRWM recommended.

The third area which impinges on CoRWM's support for disposal was arrived at after comparison with other methods of waste management. A little examination reveals that very quickly – and totally unsurprisingly – the only two options available for comparison left to CoRWM after the elimination of firing it off to the sun and other exotic options were disposal and interim storage. The question CoRWM was then faced with is how can these possibly be compared with any sort of adequacy when storage could only be foreseen for 300 years – the limit of time which is generally regarded as the period over which institutional control can be guaranteed – and when disposal will have impacts which are likely to affect generations tens of thousands of years into the future? The answer is that a robust comparison is inevitably unsatisfactory and only capable of being performed by examining the 999,700 years after the storage comparison ends through the lens of the level of confidence members were prepared to register in the long term safety of deep disposal.

So it cannot be said that CoRWM recommended disposal without acknowledging the fact that that recommendation sat within a set of mutually supportive recommendations. These were essentially R and D, a security-led storage review and only then, if there was societal consensus and if a volunteer community could be identified so as to adopt a different approach to that of imposition which has been tried with such singular failure in the past, should disposal go ahead. The comparison against which CoRWM recommended disposal was unavoidably imperfect but there were other problems as well, in particular what CoRWM argued was the single most important criterion in respect of justifying disposal – it purportedly removed a burden from future generations.

It can be argued that, far from removing a burden, disposal actually *passes on* a burden to future generations. After all, disposal removes the element of choice and freedom of action and commits future generations to a level of radiation exposure acceptable to today's regulators (although not necessarily acceptable to everyone) but to a level which may not be acceptable to our descendants. It also presents the possibility of requiring future generations to retrieve the waste at some point in the future should the repository fail or should other circumstances arise which require the reversal of the emplacement procedure and thereby foist on them all the burdens, from radiation exposure to cost, which disposal today seeks to remove.

This 'removal of a burden' criterion played a significant role in CoRWM's assessment of the options and in assessing the level of support for disposal among stakeholders and the public alike. The 'removal of burden' criterion dominated the justification for disposal and found a significant ally in a variant of the disposal option which had been developed by Nirex in response to their belated realisation at the RCF that people didn't trust a repository not to leak even over a short period of time and that they therefore wanted retrievability built into the concept. This resulted in the '*phased* deep geological disposal option' in which the repository can remain open for up to 300 years to accommodate the retrieval of the waste in the event of something going wrong.

This 'phased' variant of deep geological disposal more than any other single issue in the CoRWM's programme caused disagreement among the members due to the conflicting issues it raised. If the single most important

attribute of disposal is the removal of a burden to future generations by putting the waste underground and sealing it all up as quickly as possible, then surely, that very attribute, that very cornerstone of the justification for disposal is removed if a repository is allowed to remain open for centuries in what is effectively an underground store. So here we had an underground storage option masquerading as a disposal option and unashamedly picking up support from those in favour of disposal (due to its putative 'burden removal' qualities) as well as from supporters of retrievability (due to its purported ability to embrace 'flexibility', an attribute hitherto connected exclusively with storage).

Thus a 'disposal option variant' – phased deep geological disposal – came out on top in just about every evaluation CoRWM undertook and its removal from the list of options on the grounds that it proposed an inferior and flawed variant of disposal was resisted on the grounds that a potential host community should have the option of closing a repository when they felt it was appropriate.

The long term safety of disposal can inevitably only be assessed theoretically. The case in favour rests on the view that the barriers between the radioactivity in the waste and the pathways back to humans and to the environment where it can do damage are sufficient to retard the release of the radioactivity for hundreds of thousands of years into the future at which point the impact of the radioactivity will be 'insignificant' and comparable to the impact of natural uranium in the environment today.

There are two man-made barriers, the containment of the waste (conditioning) – barrels, drums, the matrix in which they are stored, overpacks etc - and the backfill which will be pumped into the vaults after emplacement of the waste. The containers have a lifetime of maybe 100 years. The backfill – cementatious material will in all likelihood be used - is designed to create the optimum chemical environment in the repository to retard decomposition. But it is likely to warp, to split and to crack possibly within decades, certainly within centuries after closure. It will also become saturated with water.

The other potential man-made barrier is the lining of the vaults and the roadways before backfilling. This would help isolation of the waste but for how long is uncertain. The use of liners is costly and it remains to be seen if the NDA, with its 'value for money' remit will recommend going to such expense.

But there is, of course, the primary barrier represented by the host geology itself. Geologists will argue as they did to CoRWM members that some geologies in the UK have been stable for 4 million years and that if we can trace that sort of history and have confidence in it, then we can identify 'ideal' geologies for a repository which we can predict will remain stable for a similar period of time into the future. That may well be so but it is also true that if you take an ideal geology and carve out a massive chamber in it as large as five Albert Halls, common sense tells you it is no longer 'ideal'. Backfilling it with concrete or another substitute for the original material renders the original rock or host geology inherently weaker than it was originally. A clay backfill will mould itself more readily to the 'perturbations' created by the intrusion, but water ingress is still a problem and a likelihood over the longer time scales involved. Geologists admit that fissures will occur when drilling a hole in crystalline rock but argue that those fissures will close over a century or so although such an assertion remains, again and inevitably, based on assumptions.

Once a differential has been created in the geology, water gravitates towards it and it is this water which will transport the radioactivity to the biosphere. This is not in dispute: what is in contention is the rate at which that transfer will occur, over what timescale, carrying what radioactive material and with what impact to the environment and to people. Critics argue that a potentially fissured geology, decaying containers and saturated backfill are not going to contain the waste for a fraction of the time proponents suggest.

Nirex were asked by CoRWM to look at 'the worst that could happen' in a repository setting and 'did whatever happened really matter'? Nirex concluded that the worst that could happen was that after 200,000 years there could be a 'peak dose' event caused by leaking radioactivity which would cause an exposure to the critical group of 10 milliseiverts – ten times the currently permitted annual dose to members of the public but only at the

higher end of the natural background dose from uranium decay experienced by some communities in places like Cornwall.

CoRWM put these findings to the Low Level Radiation Campaign which is working closely with the European Committee on Radiation Risk. They argued that the level of radiation being released from the repository in the Nirex model could, in their opinion, and based on emerging data about the interactions between uranium and human DNA, give a dose up to 250 times that currently permitted. Their conversion co-efficients, even without the DNA binding theory, gave an exposure level of 20 times the currently permitted exposure, or twice that predicted by the Nirex model.

This is a moral issue: the level of exposure we are told to find tolerable today, giving a notional risk of 1 in a million for a cancer death to result from exposure to radioactivity, is not only meaningless since it is set at a level which is designed to give comfort that the risk is sufficiently small for us to accept it but it also represents the imposition of a risk over which we have no control. We are proposing the same for future generations with disposal. Even if the exposures were as Nirex suggests or even if they were at levels we permit today, there is no saying what future generations might discover 100, 1000, 10,000 years from now which might cause them to rail at our intemperance. We are irreversibly committing future generations to a dose of radioactivity over which they have no say and no control.

Perhaps we should not see far distant communities – even if they exist in 100,000 years time – as being worthy of our concern in the year 2007. But even at that far distant point, the waste we bury today or in the next few decades will still be lethal to living organisms and we have a duty not to compromise future generations by burying waste in a hole in the ground simply to demonstrate we can 'solve' the radioactive waste problem and get on with the ludicrous task of creating more. For make no mistake, the driver behind this rush to find a repository and a willing community is all about facilitating new nuclear build.

This generation has a responsibility to store the waste securely in terrorist-proof, underground facilities, to provide the funds, to retain and advance the expertise and the skills to those who follow to make a better job of the mess, to find a more sophisticated solution to radioactive waste management than sticking it in a hole in the ground. We have an obligation to get on with the R and D programme right now rather than spend our time justifying a 'solution' to a sceptical public in the quest for a willing community and an 'adequate' geology and in order to clear the decks for another generation of nuclear power stations, the waste from which future generations will be required to manage. If getting rid of legacy wastes, through the deep geological route to remove the need for future generations to manage our detritus, can be justified as being morally and ethically responsible, then surely, logic dictates that creating more of the same is immoral and unethical.

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