

Notes from CoRWM seminar, 22nd September 2010

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Background and overview

The seminar was organised to enable members of the West Cumbria Managing Radioactive Waste Safely Partnership, local politicians and council officers to further understand the context for geological disposal, and the thinking and work that the Committee on Radioactive Waste Management (CoRWM) went through in developing its recommendations to the Government. For a full list of those in attendance, please see Appendix 2.

The seminar took the form of a presentation from CoRWM on its work and conclusions, followed by the opportunity for discussion and questions.

The following handouts were provided on the day:

- Chapter 13 of CoRWM's final report, July 2006 (for the full report see <http://www.corwm.org.uk/Pages/Current%20Publications/700%20-%20CoRWM%20July%202006%20Recommendations%20to%20Government.pdf>).
- A copy of the letter sent by Pete Wilkinson, member of CoRWM, to the Secretary of State in October 2007 (see Appendix 3).

Copies of the presentation slides are provided below, followed by a summary of the questions and discussion that followed. Please see Appendix 1 for a glossary of terms and abbreviations used in the slides.

CoRWM presentation slides



Developing CoRWM's First Five Recommendations

Brian Clark and Mark Dutton
West Cumbrian Partnership Workshop
22nd September, 2010

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This presentation gives the personal view of the speakers and should not be seen as the authorised position of any third party unless that is specifically stated.

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The Options

- After eliminating concepts on technical, legal and ethical grounds that would be very difficult to implement, CoRWM spent 18 months assessing
 - 6 options for long term storage
 - 3 options for geological disposal
 - 5 options for near-surface disposal for short-lived wastes.
- The options for geological disposal were:
 - Geological Disposal in a mined repository
 - Deep Borehole Disposal for HLW, SNF & Pu
 - Phased Geological Disposal in a mined repository

Assessment Method

- Based on a review of international experience, CoRWM used a method that combined assessing:
 - Individual aspects (criteria) of each option (Multi Criterion Decision Analysis – MCDA)
 - Assessing each option as a whole (Holistic Assessment)
- Recommendations resulted from a long deliberative process that was informed by both assessments, scientific advice, PSE, overseas experience and consideration of ethical issues (Ch 14; Pa 1)

Inputs to MCDA

- Aspects to be assessed (criteria) – PSE
- Assessment scale – experts
- Assessment of each option (scoring) – experts
- Relative importance of each criterion (weighting) - PSE

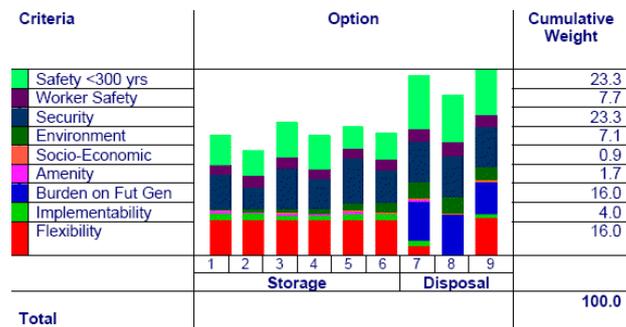
Assessment Criteria

- Public safety
- Security
- Burden on Future Generations
- Flexibility
- Worker safety
- Impact on the environment
- Ease of implementation
- Amenity
- Socio-economic
- (Cost)

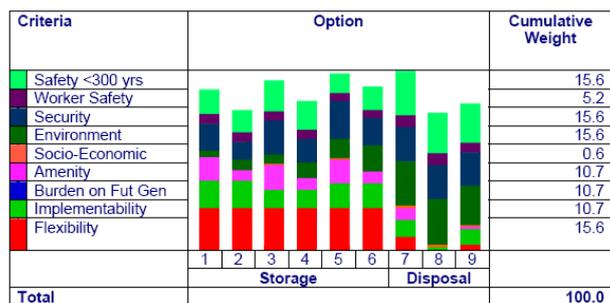
Scope of MCDA

- The safety of stores relies on institutional control
- Institutional control (IC) can not be guaranteed at long times into the future
 - Containment needs to be provided for hundreds of thousands of years
 - IC can be lost by climatic changes, i.e. ice ages and sea level changes, war, decease etc
- Thus, disposal can only be compared with storage over a period for which institutional control can be expected – few hundred years?

Example Result of MCDA (HLW)



NGO Weighting



Results of MCDA

- Geological disposal ranked higher than storage
- The difference is substantial for most types of waste
- Generally boreholes are the lowest ranked option (Ch 11; Pa 31)

Results of Holistic Assessment

- Most members preferred geological disposal for HLW, SNF, ILW & Pu reflecting confidence in long-term safety and ethical considerations
- Some preferred bore holes for SNF & Pu – security
- Remainder preferred storage reflecting a lack of confidence in long-term safety and ethics

Ethics

- Fairness between generations
- 'Do it now or later'?
- 'Now' removes the burden of storage from future generations provided there is confidence in long-term safety
- 'Later' gives future generations the choice of how to manage the waste and retains control over the hazard (Ch 13; Pa 2-4)

Overseas Experience

- In the 60 year history of waste management there are only two licenced repositories for higher activity waste. Generally, the waste has been safely stored.
- However, in those countries that have made firm decisions on long-term waste management strategy, all have decided that geological disposal is the best way forward

PSE

- Majority view of the four UK Citizens' Panels was that some form of geological disposal should form part of the overall strategy
- Geological disposal was favoured by EA, SEPA, HPA, the nuclear industry, most local authorities, trade unions, learned societies and professional bodies
- Greenpeace, Friends of the Earth and the Welsh Anti-nuclear Alliance strongly opposed to disposal

Pro-disposal Arguments (1)

- High confidence in the scientific community that there are areas of the UK where the geology and hydrogeology will be stable for a million years and more
- This confidence is based in part from a reconstruction of the historical records
- Natural analogues (Canada & Gabon) show that geologies with a low water flow will retain radionuclides over very long periods (Ch 13; Pa 28)

Pro-disposal Arguments (2)

- Research suggests that the local geology will recover from the initial disturbance and remain stable
- The scientific community, including the regulators, consider that the most mobile forms of radioactivity have been identified
- Taking account of uncertainties, regulators are satisfied that risk targets can be met in all countries where sites have been evaluated.

Pro-disposal Arguments (3)

- If risk targets are met, uncertainties would not raise the level of exposure to greater than the natural levels in some parts of the UK
- HPA judge that the uncertainty in the ICRP dose factors for the nuclides that will contribute most to the dose is less than a factor of two
- Thus it is very unlikely that significant harm to humans or other species will occur even over hundreds of thousands of years.

Anti-disposal Arguments (1)

- Any predictions over a timescale of a million years are unverifiable
- Uncertainties are clearly manifold over such long periods
- Gas production and container corrosion may invalidate predictions
- Backfill material may shrink or crack
- Chemical and microbiological reactions may be poorly understood

Anti-disposal Arguments (2)

- Groundwater and gaseous pathways can not be fully understood
- The claim that the geology will recover from the perturbations during construction is challenged
- Radiological protection standards have become more stringent over time and what is acceptable now may not be accepted in the future
- The ICRP dose factors are challenged by the Low Level Radiation Campaign

Conclusion of the Deliberations on Geological Disposal

- The scientific debate between supporters and opponents of geological disposal can not be resolved now on the basis of incontrovertible evidence (Ch13; Pa 32)
- There is strong support for disposal among scientists and regulators but an opposite view is taken by those who challenge the reliability and quality of the evidence
- The great majority of members had sufficient confidence in geological disposal to recommend it to Government given the present state of knowledge
- The critical issue for most members was that the safety of long-term storage depends on an expectation of continuing institutional control and there is a risk that it may be lost (Ch 13; Pa 32 – 33)

Development of Strategy

- Integrated set of proposals that took account of the different perspectives
- Geological disposal as best approach but recognised that there are ethical and social concerns and implementation may take many decades
- Therefore, robust interim storage, R&D to support geological disposal, research into alternatives and a staged process are important elements.

Recommendation 1

- **Within the present state of knowledge, CoRWM considers geological disposal to be the best available approach for the long-term management of all the material categorised as waste in the CoRWM inventory when compared with the risks associated with other methods of management. The aim should be to progress to disposal as soon as practicable, consistent with developing and maintaining public and stakeholder confidence.**

Recommendation 2

- **A robust programme of interim storage must play an integral part in the long-term management strategy. The uncertainties surrounding the implementation of geological disposal, including social and ethical concerns, lead CoRWM to recommend a continued commitment to the safe and secure management of wastes that is robust against the risk of delay or failure in the repository programme. Due regard should be paid to:**
 - reviewing and ensuring security, particularly against terrorist attacks;
 - ensuring the longevity of the stores themselves;
 - prompt immobilisation of waste leading to passively safe waste forms;
 - minimising the need for re-packaging of the wastes; and
 - the implications for transport of wastes.

Recommendation 3

- **CoRWM recommends a flexible and staged decision-making process to implement the overall strategy, which includes a set of decision points providing for a review of progress, with an opportunity for re-evaluation before proceeding to the next stage.**

Recommendations 4

- **There should be a commitment to an intensified programme of research and development into the long term safety of geological disposal aimed at reducing uncertainties at a generic and site-specific levels, as well as into improved means for storing wastes in the longer term.**

Recommendation 5

- **The commitment to ensuring flexibility in decision-making should leave open the possibility that other long-term management options (for example, borehole disposal) could emerge as practical alternatives. Developments in alternative management options should be actively pursued through monitoring of and/or participation in national or international R&D programmes.**

Doug Ilett, Environment Agency
Input on the regulators' view on geological disposal

The Environment Agency's statutory duty is to protect people and the environment – which includes everybody in this room. I'm part of the technical team who, since 2003, have scrutinised the work of the NDA's Radioactive Waste Management Directorate (RWMD), and who are coordinating the ongoing scrutiny of RWMD jointly with the Nuclear Installations Inspectorate and the Department for Transport.

Geological disposal is Government Policy now, but even when the CoRWM1 deliberations were going on, the Environment Agency's position was that geological disposal was the only sustainable way to manage higher activity wastes in the long term – this was our stated position then and it still is now.

Regarding Nirex, we examined the earlier work that Nirex did for a phased geological repository and also looked at international work available at the time. We produced what became known as the 'Viability' report i.e. our view then on the ability of Nirex to make a case for geological disposal and the technical underpinning of their work. Given more research we felt it was possible for them to make a successful safety case, but we did however have a number of things to say. We didn't feel that the 'phased' aspect of their work was at that time sufficiently underpinned (although it was possible it might be made so), mainly due to the difficulties in maintaining the integrity of waste packages for the 500 year period the repository might remain open.

The Nuclear Energy Agency (NEA) document *'Moving Forward with Geological Disposal of Radioactive Waste'* (2008) summarises the international position on geological disposal, and basically states that, in the view of quite a lot of countries, geological disposal is feasible.

We, the Environment Agency, think that it is the way forward. We think that the case can be made – we think there is work to be done but we think that it can be done. We have guidance on the safety case that has to be made – it is not prescriptive but it does require high standards to be met.

Questions and discussion

The questions and areas of discussion following the presentation are summarised below. This is not verbatim but aims to capture a flavour of people's questions and comments raised, together with responses. The questions, statements and responses are from individuals and are not formal statements by their organisations.

Q – You said that the evaluation of the ‘worst case’ dose was for intermediate level waste. What would happen if a high level repository went wrong?

A – There’s no reason why that should be different. Nirex did the calculation for intermediate level waste (ILW) because they had the modelling in place to support the safety case for their ILW concept.

The recommendations also include a recommendation for robust interim storage – i.e. storage that will last for at least a century in case there are delays or failure in implementing geological disposal. There are other potential options such as boreholes. This is why it was recommended that there should be a staged process with defined stages, and at each stage, a check to determine if geological disposal is still the right option.

Q – With regard to the evaluation of storage against disposal, what difference does the quantity of waste make – would it hold true for any quantity or was it a specific quantity?

A – The evaluation was done for the different types of waste and there was a separate assessment for each type of waste. The assessment of options depended on which type of waste we were considering. For example, we carried out separate assessments for ILW and high level waste (HLW). In the assessments, the experts didn’t rate the safety of geological disposal of ILW quite as high as for HLW. The top score was given for HLW and the score was slightly less for ILW.

Q – Were the CoRWM recommendations simply for legacy waste as opposed to new build?

A – The CoRWM work up until 2008 only considered legacy waste.

Q – You tell us that there will be boreholes that extend several km into the Earth. What protection will there be from the heat? What effect will heat have on the waste?

A – There would not be any protection. The essence of deep boreholes is that you’d be so deep, that there would be enough containment for the radioactivity not to reach the biosphere even if the waste packages were affected by the heat. Potentially, the boreholes would be so deep that the waste would fuse, but that wouldn’t be a problem as it would be so far from the biosphere.

Q – How can you make recommendations for waste that remains hazardous for up to 1 million years?

A – The key issue is the containment of the waste for the amount of time it remains hazardous and for some wastes that is 100s of 1000s of years. The whole issue is around the concept of geological timescales. Geological timescales are so different from our own that it’s very difficult for most of us to get our minds around them.

Geologists are fine – they can say that because some geological formations have been stable for many millions of years that they can say with confidence that it will be stable for the next million years. Non-geologists find it difficult to come to grips with that. All of the geological experts were in agreement – they all said that in the UK we have stable geologies and hydrogeologies.

Statement – In my opinion, CoRWM and all the other bodies have learned nothing since Nirex. Copeland Council’s policy is for deep storage but not disposal, and one of the main things that we’re looking for is the geology to protect the people. You said that the trade unions support geological disposal. As far as I’m aware, the unions round here would support a repository so long as it is monitorable and retrievable. The unions all favour disposal for as long as we can make it retrievable. I accept the argument that one day we will not be here and that makes the custody of the material irrelevant, but we have a long time to go before we can make some considered judgements. We’ve only had the nuclear industry for a number of decades. I’ve worked in the industry for a lot of years and I’ve seen waste repackaged a number of times. Packaging methods have improved a great deal. One of the main reasons we’ve said we want retrievability is that we can do something about it.

Response – In terms of retrievability, we assessed 3 options for geological disposal. As well as boreholes, we had geological disposal in a mined repository, and phased geological disposal. Phased geological disposal is the concept developed by the former Nirex in which the waste can be kept monitorable and retrievable for up to a few hundred years after all the waste has been emplaced.

Our recommendations included both of those options and didn’t distinguish between them. We had a long discussion and agreed amongst ourselves which one we preferred, but what we said to the Government was that the decision should not be made until a host community has been identified, and that it should be involved in that decision. If we had known that West Cumbria would be involved, we would have said that the whole issue should be discussed with the people here in West Cumbria, and that they should be involved in that decision. The extent of retrievability and monitorability, and the extent of time for which it should be provided, are now part of the decision making process that will include all of you, and that is stated clearly in the 2008 White Paper.

Statement – Nirex’s argument was that we’re going to put this stuff in and effectively grout it in with material which is a bit like a ‘crunchie’. One of the arguments was that you can dig through that ‘crunchie’ to get through it – how are you going to do that? Many of us campaigned long and hard against Nirex, but they wouldn’t listen. It feels like it’s going the same way again now.

Statement – Re pathways through geology, any mining engineer will say that no matter where you dig a hole in the ground, water will run through it unless you go down to basement rock. The passage way through to that basement rock will collect water and then you need drainage. My favoured argument is to go into a mountain like Black Combe. It is basement rock and it’s probably the most stable rock in the whole of the north of England. You can drive a tunnel into it. What water does get

into it can be retrieved. It can be monitored, it can be retrieved. If you put it down 1000 to 3000 feet, you can't get it out.

Statement – You mentioned about boreholes, in Sweden they're using boreholes to place spent fuel in. When I visited Sweden, Germany and elsewhere I saw it with my own eyes. I've seen it in Sweden, I've seen the road going down there, I've seen the satellite images. It's one of their marketing images. I was astounded by the amount of water that was in there, running down the hill. I was astounded by the concrete.

Response – I think there may be some confusion. The Swedish concept is not a borehole. The option that's been adopted by Sweden and Finland is a mined geological repository in hard rock, because that's all they've got. In order to determine the characteristics/properties of the rock they've drilled boreholes.

The repository that is being constructed in Sweden is for spent nuclear fuel. If you walk around the Aspo underground rock laboratory that was built to carry out research to support the repository, it is true that you see water running down the walls. A mined repository will become saturated with water unless it is somewhere very dry and that's all right provided that the groundwater takes a long enough time to reach the biosphere.

Response from CoRWM – With regard to boreholes, we're talking about something that is half the circumference of this table drilled straight down into the ground. [A comparison was made to the Chilean mine rescue shaft.] That's the important difference between boreholes and the tunnels going down into the repository.

Q – With regard to boreholes, the water question was answered, what about gas leakage?

A – Gases will be generated in ILW. A requirement of the siting process and the safety case is to demonstrate that the radioactive gasses will take so long to reach the biosphere that the radioactivity will have decayed or that they have been absorbed by the rock. All of the expert input was that you can find geologies in the UK such that the radiological consequences of gas reaching the biosphere would be acceptably low.

Most of the gases will be produced in ILW. Boreholes are only practical for small volumes of waste such as HLW or plutonium.

Statement – About 10 years ago, as part of the CoRWM project, we were asked, as a council what our requirements were. It was simply for the Government to go to every council in the country and ask them if they would like to be considered for a repository. It's cost millions of pounds, and do we still know who wishes to be considered? With regard to geology I would have thought that would have been established very early on.

A – Very early on following our recommendations, the Government had another period of consultation and produced a White Paper saying what the policy would be. Inherent in the paper was the CoRWM recommendation that the process should be a voluntary one. So what the Government did, at the same time as they published the White Paper, was to issue an invitation to all the councils in England and Wales to take part in the process. It was this

invitation that Copeland, Allerdale and, subsequently, Cumbria County Council responded to.

Other areas have debated the issue in full council, but in many instances a decision not to respond has been taken by an officer or the leader of the council.

Statement – It’s unlikely. We’ve got the waste, everybody else hasn’t – it’s the only reasons we’ve put our hat in the ring.

Statement – One of the groups in support of CoRWM’s recommendations was local authorities. How much credence can you have over local authority support when the only ones that have come forward are the 3 here?

Q – You keep expressing that we have stable geology and hydrogeology in this part of the world. There have been 2 significant earthquakes in this part of the world over the last few years. How much has that been taken into account? The man from Finland who came to speak to us was a bit concerned that, once there’s been an earthquake in an area, there might well be more. I’m finding it a bit difficult to square the statement about stable geology with the fact that there have been earthquakes.

A – CoRWM looked at the UK as a whole and we made judgements based on the geology of the UK as a whole. We have made no comment about the geology in West Cumbria. In terms of volcanic activity, that has to be assessed for each area that is considered and a demonstration that volcanic and seismic activity is acceptably low is part of the safety case. That whole process has still got to be gone through in terms of this part of the world.

Q – You said that in terms of intrusion into the rock, things would settle – what evidence do you have of that?

A – I would have to dig back to find out the references, but all of the mining and geological information that we received, showed that disturbance would settle out over a relatively short amount of time. It is on that basis that all of the other countries have decided to go forward with geological disposal.

Q – I’ve worked down the pits. Deep pits appear all over the place, they keep appearing [reference made to recent example in Whitehaven]. How do we know whether we’re going to dig into these? Have they considered the old mine-workings?

A (from the NDA) – They have been, and will be, considered as we move into the siting process.

Q – Will the geology in the area investigated by Nirex be appropriate to take a repository?

A – The process is staged and we’re now at the stage where the councils have to decide whether they move to the next stage or not. If the answer is yes, and that’s a big if, then the next stage is to look at specific areas in more detail

There has been a study by the BGS, to identify those areas which are clearly unsuitable. Without making any comment on the suitability, the next stage is to go from that information to identify potential sites for the surface facilities and for the actual site for the repository

underground. That is only if there is a decision to move forward – only then would the detailed investigations occur.

Q – Did Nirex fail because of the geology?

A – The Nirex Inquiry failed on a number of counts. The safety case was not robust. They did a lot of work afterwards but it was not robust at the time of the Inquiry. There had been no involvement of the regulators i.e. Nirex had not worked with Her Majesty’s Inspectors of Pollution before they went to the Inquiry. A number of the environmental studies that were required had not been undertaken, as well as a number of other studies. All in all, the inspector was faced with an unsatisfactory application.

[It was noted by an audience member that the Nirex Inquiry was for a rock laboratory not a repository. Although Nirex had been working on the safety case for a repository, submitting a safety case to the inquiry was “foisted” on them by the Government at very short notice, which explains why it was so unprepared.]

Q to the Environment Agency – You said that the Nirex work wasn’t technically underpinned. Can you give us some examples?

A from Doug Ilet – To clarify, we said the work wasn’t *sufficiently* technically underpinned at that time. Nirex were putting forward a phased repository concept. With such a concept, the time period that is being thought about for “phasing” is important. There are always going to be a number of years (in the region of 50-60 years) during which a repository will be operational. At the time, Nirex were looking at periods of 100-300 years, and their specifications for waste containers were for the containers to last for up to 500 years. The technical underpinning to say that they would last for up to 500 years underground without failing was not sufficient.

Q - How many international research programmes are going on? For example is it thought that over the next few 100 of years, that there may be a breakthrough that could make higher activity waste less active, and what research is going on to that end now?

A – There are at least 2 international research programmes in which a number of countries come together to carry out research. One research programme is funded by the European Commission and also involves Russia and other countries that are not in the European Union. That is addressing some major generic issues that are relevant to the safety case.

In addition, each of the major countries, e.g. Finland, Sweden, France, the US, the UK, Japan and Germany, has its own research programme.

The French are carrying out research into disposal, storage and partition, and transmutation. The idea with transmutation is that you treat radioactive material to make it safer/reduce the half life. This is not practicable with the UK’s waste – the amount of time and money involved to transmute it is so huge that it is totally impractical. The research that is going on may have an application for futuristic fuel cycles, i.e. ones in which the fuel is very different to that used in our current reactors. It is therefore very blue sky with respect to our waste today.

Q – The cost difference between storage and disposal was not great. You confirmed that this was about storage as done at the moment. Do we have any comparative costs of underground storage [also known as phased geological disposal]?

A – From memory, the expert input was that there were very great uncertainties on cost, but essentially there wasn't a great difference between the two. In the comparisons between storing for 300 years, a geological repository, or a phased geological repository, there was considerable overlap of the ranges of costs evaluated for the 3 options

Q – There were essentially 13 members on the committee – what was the split in view between storage and disposal?

A – To give you an idea of the range of the kinds of people on the committee, one had been in the nuclear industry since 1964, one established Greenpeace and Friends of the Earth in the UK, one was a professor of the Open University and is now a leading light in BAND (Blackwater Against Nuclear Development) which is opposing new nuclear reactors at Bradwell.

The other members (and the professor above) had no great difficulty in coming to the conclusion that a strategy that included geological disposal was what we should recommend to the Government.

All of the CoRWM members bought into the complete set of recommendations, but it was recognised that geological disposal would require an enhanced programme of research to address the issues that still needed to be resolved. During the whole time that the original CoRWM committee worked there was often considerable differences of opinion on some issues, but there was buy-in to the recommendations. Broadly, with one major exception, the Government did accept the whole package.

Appendix 1 – Glossary of terms in presentation slides

EA	The Environment Agency
HLW	High level waste
HPA	Health Protection Agency
IC	Institutional control
ICRP	International Commission on Radiological Protection
ILW	Intermediate level waste
MCDA	Multi-criteria decision analysis
Natural analogues	An occurrence of materials or processes which resemble those expected in a proposed geological waste repository (Côme & Chapman, 1986)
PSE	Public and stakeholder engagement
Pu	Plutonium
SEPA	Scottish Environmental Protection Agency.
SNF	Spent nuclear fuel.

Appendix 2 – Attendees of the CoRWM Seminar, 22nd September 2010

Charles Holmes	Allerdale Borough Council Partnership member
Cllr Yvonne Clarkson	Copeland Borough Council Partnership member
Cllr David Southward	Cumbria County Council Partnership member
Cllr Keith Hitchen	Copeland CALC Partnership member
Chris Shaw	Allerdale/Copeland CALC Partnership member
Revd Dr Lindsay Gray	Churches Together in Cumbria Partnership member
Robert Allison	Lake District National Park Authority Partnership member
Simon Rowley	South Lakeland District Council Partnership member
Cllr Clare Feeney Johnson	South Lakeland District Council Partnership member
Cllr Geoff Smith	Allerdale CALC Partnership member
Alun Ellis	NDA Observing member
Cllr Joe Sandwith	Allerdale Borough Councillor Seaton
Cllr Jean MacLeod	Allerdale Borough Councillor St Michaels Workington
Cllr Joseph Robertson	Allerdale Borough Council Workington Moorclose
Cllr Alan Tyson	Allerdale Borough Councillor All Saints Cockermouth
Cllr Henry Wormstrup	Copeland Borough Councillor Harbour
Cllr Dave Banks	Copeland Borough Councillor Cleator Moor South
Cllr Michael McVeigh	Copeland Borough Councillor Egremont South
Cllr Frank Morgan	County Councillor Cleator Moor South & Egremont
Cllr John Woolley	County Councillor Mirehouse Whitehaven
Cllr Hilary Carrick	County Councillor Penrith North
Mark Dutton	CoRWM
Brian Clark	CoRWM
Doug Ilett	Environment Agency

Appendix 3 – Copy of letter from Pete Wilkinson, member of CoRWM, to the Secretary of State, 8th October 2007

Right Honourable Hilary Benn MP
Secretary of State for Environment,
Food and Rural Affairs
Nobel House
17 Smith Square
London SW1P 3JR



WILKINSON
ENVIRONMENTAL
CONSULTING LTD

8 October 2007

Dear Secretary of State,

The Managing Radioactive Waste Safely (MRWS) Programme: Implementation of the Recommendations of the Committee on Radioactive Waste Management

From the end of 2003 until its disbanding in August 2007, I was a member of the Committee on Radioactive Waste Management (CoRWM).

Defra officials will shortly be provided with a suite of CoRWM sign-off documents agreed by the pre-August 2007 CoRWM membership. As a member of the committee, I agreed to sign off those documents with the proviso that I would add my own further comments about the CoRWM process, its outcome and the nature of Government's response as I felt the documents we considered and which are now in the public domain did not adequately reflect my views. Moreover, there are issues to which, in my opinion, the Committee has not given sufficient prominence in its sign-off documentation, as well as in its justification for recommending deep geological disposal. I feel obliged to bring these matters to your attention as I believe they have relevance to the implementation of the MRWS programme. This letter contains those further comments and elaborates on those issues. I am making this letter and its contents public.

The points are made below in greater detail under headings related to the limitations of the process, the lack of balance in the Government's proposals to progress MRWS, implementation and the risks to the programme.

I should make clear that I respect the sincerity of my former colleagues and that the views expressed here are in no way intended to impugn their collective or individual integrity. So far as I can ascertain, the opinions expressed here are exclusively mine although the sign off documents allude to some issues, particularly those relating to Government response to the CoRWM report. In addition, I would point out that I have argued these issues with my former colleagues on many occasions so there is nothing expressed here about which they are unaware nor unfamiliar.

Limitations of the CoRWM process

Introduction of the 'removal of burden' attribute

CoRWM based a good deal of its justification for recommending disposal on the suggestion that disposal 'removes a burden from future generations' (another being the heightened security aspect of burying waste deep underground). I maintain that such a notion is at best arguable and at worse, misleading. It can be equally argued that, contrary to removing a burden, disposal stores up a greater burden for future generations when they inevitably have to deal with the consequences of disposal in the shape of migration of radioactivity back to the biosphere. Far from removing a burden, disposal creates a radiological burden for future generations. While I accept that the generation which created the waste should shoulder whatever part of the burden it can, the fact is that, once created, there is little this generation can effectively do to remove the burden to future generations. The radiological burden represented by the waste cannot be removed by burying it. Should an event occur which caused the catastrophic release of radioactivity into the environment, the remedial action a future society might be required to undertake would in all likelihood be a far greater burden than the one imposed on them by passing on the current legacy of radioactive waste in secure, stored form. Regardless of this, the majority view used at workshops to underpin the support for disposal was that 'disposal removes the burden'. The contentious nature of this argument will be exposed as the MRWS programme progresses and it will further weaken the case for disposal.

Removal of burden can only be seen to apply over the relatively short-term and only in potentially temporary fiscal terms. Government reaction to the CoRWM recommendations indicates quite clearly that disposal is seen as a 'solution' to nuclear waste management (despite the fact that CoRWM has repeatedly said it did not intend its recommendations to be seen thus) and that the implementation of this 'solution' will remove a significant hurdle to new build. Thus, even giving the benefit of the doubt to the 'removal of burden' claim, the removal of one burden will simply help to create another.

The 'retrievable disposal option'

The CoRWM process and the conclusions drawn were compromised by the inclusion of a disposal variant which claimed that it could offer 'removal of burden' to future generations while at the same time offering 'flexibility' in that the repository could remain open for upto 300 years to facilitate waste retrieval. This option, known as phased deep geological disposal, was deliberately developed by Nirex in the wake of the failed Rock Characterisation Facility (RCF) programme in 1997 as a variant of disposal specifically - and, some would argue, cynically - designed to accommodate the public demand for retrievability while linking it illogically to Nirex's preferred option of disposal. Apart from the incongruity of the need for CoRWM to assess a retrievable disposal option, the variant offers contradictory and irreconcilable attributes.

Once the 500,000 cubic metres of legacy waste had been emplaced in a repository five times the size of the Albert Hall one kilometre underground at the cost of many billions of pounds it is hard to see what conditions would have to apply before retrieval was implemented at an equal or perhaps greater cost. In addition, agreement over how the trigger for retrievability would be identified is difficult to see. Claiming that a disposal option can support retrievability undermines the very attribute upon which disposal putatively benefits society – i.e. removal of burden: at what point and under what conditions would the recreation of the burden by retrieving the waste be considered justified? It is

worth pointing out that the liquid radioactive wastes from Sellafield into the Irish Sea from reprocessing activities there have a known and calculable health impact. This has not resulted in the practice, which began in the 50s and which continues today, being stopped.

Logically, as well as historically, retrievability is accommodated exclusively by storage. If the votes from the engagement processes CoRWM conducted which were logged in support of storage are added to the votes for the purported quality of 'retrievability' attributed to 'phased disposal', it can be shown (see attached paper) that there is a majority desire among the public for waste to be managed in a manner which makes it retrievable. Thus, *the notion of retrievability, either through the storage option or as a supposed attribute of phased disposal, was clearly the most important issue for the majority of those members of the public and a number of stakeholders who preferred options with a retrievability element over prompt disposal.* It is my view that the 'phased disposal option' does not offer a retrieval facility although CoRWM – wrongly in my view – used the predictable support for an option which purportedly offers removal of burden *as well as* flexibility (i.e. retrievability) as evidence of support for disposal. I argue that it shows support for *storage* as the only option which realistically offers retrievability.

Inadequacy of option comparison

CoRWM recognised that because of the great differences in the timescales against which the performance of the options were required to be measured, a true comparison between storage and disposal was impossible. Since storage can only be set against the accepted projection of 300 years over which societal and institutional control is generally considered to be predictable, it was necessary to try to identify a method by which some sort of judgement could be made as to the safety of deep geological disposal over the very long-term – hundreds of thousands of years. In the face of what I would argue is the impossibility of that task, it was nonetheless decided that members should express this judgement as the 'level of confidence' we could individually ascribe to long term safety based on advice from organisations such as the Geological Society. Significant uncertainties relating to (inter alia) the physical impact of creating the repository in an 'acceptable geology', the performance of a repository over these inconceivable periods of time, the rate at which radioactivity will migrate from the repository back to the biosphere, the impact of that radioactivity on future populations as well as the ethical arguments about committing future generations to levels of exposure over which they have no control and which they may find wholly unacceptable, were acknowledged by CoRWM. Although keen to point out the extent of these uncertainties, the majority of CoRWM members expressed sufficient confidence in the long term safety of permanent disposal to be able to recommend it as the current best available option, a view from which I dissented. In my view, insufficient evidence exists which could result in confidence that radioactivity would or could be contained within a repository until such time as it was rendered harmless by the process of decay – i.e. hundreds of millennia.

Lack of time to examine low level radiation issues

A key issue discussed and examined during this debate was uncertainties surrounding the impact of low levels of radiation. The outcome of the Nirex's model which they provided for CoRWM and which was designed to examine the consequences of a 'worst case' – carried out, by the way, deterministically and therefore of only limited value – was that 200,000 years into the life of the repository, the 'peak dose' to the critical group could be as high as 10 millisieverts – 10 times that of

the current limit to the public and about five times higher than background radiation experienced today in areas of the country with high radon gas levels. The main conclusion of the Committee Examining Radiation Risks from Internal Emitters (CERRIE) was that internal radiation doses, i.e. from ingested or inhaled nuclides, have substantial uncertainties associated with their impact on the health of the individual. The Low Level Radiation Campaign (LLRC) also expresses concern about these issues and was asked by CoRWM to look at the Nirex results. It concluded that, given new information concerning possible interactions between uranium and DNA, the doses identified by Nirex as being potentially 10 times above current limits could, in fact, have an impact of upto 250 times current limits. The European Committee on Radiation Risks (ECRR) share these concerns and the Health Protection Agency (HPA) acknowledges significant uncertainties when considering these matters. In an interview with CoRWM as part of the bilateral engagement programme, senior HPA officials stated that, in their view, 'there are significant uncertainties about the impact of low levels of radiation exposure to large numbers of people over long periods of time'. These are precisely the conditions which are likely to accrue over an indeterminate period of time from a repository operating as designed and under ideal conditions, let alone one which does not perform in the manner we attempt to predict today. CoRWM repeatedly told Government officials of the need to give this important issue high prominence in any future R and D programme but, to my knowledge, no plans exist to deal in any effective way with this issue.

Lack of balance in the Government's response to CoRWM

These areas of uncertainty were, in my mind, taken care of in the recommendation which called for an 'intensified R and D programme'. I felt that in the process of conducting this research programme, the degree of uncertainty would be reduced to the point where societal consensus could be demonstrated or, conversely, where the uncertainties were reinforced to a level which demanded that disposal be abandoned. CoRWM also called for an on-going review and monitoring of alternatives to disposal to identify options which were more appropriate than deep disposal but it seems the recommendation for the R and D programme has apparently been all but ignored by Government. The call for an R and D programme and the recommendation proposing the search for alternatives to disposal indicate clearly that *the recommendation for disposal was not only conditional but also only one of a possible range of outcomes*.

An intensified R and D programme is essential to satisfy the public concerns expressed about disposal. In my view, it is a clear and unavoidable prerequisite to disposal. Not only has the entire R and D programme apparently been relegated to brief, oblique references but the issue of low level radiation – so vital to the confidence of the general public in any future repository development – seems to have dropped from sight altogether.

What is without doubt is that the disposal recommendation is dependent on sufficient R and D being undertaken as a priority and as a prelude to the implementation of the disposal programme. Its outcome would be used to judge whether disposal or another option is, or has the potential to be, regarded as the best management option.

Instead of taking the CoRWM recommendations as a package and initiating a full programme involving research, storage review and announcing how it will go about implementing the monitoring of alternatives to disposal, Government has selected what it sees as the solution offered by CoRWM and, to the exclusion of everything else and ultimately at the potential expense of the MRWS programme,

is pursuing a narrow programme of implementing disposal. This is an unsustainable response and will do little to enhance the level of public confidence which CoRWM painstakingly developed over three years.

Implementation

CoRWM will make these points in its own 'sign off' documents. It is worth drawing attention to the fact that the need to review of the adequacy of current storage arrangements in terms of robustness against terrorist attack was supported unanimously by the security experts CoRWM brought together to review the options. Experts anticipated a thorough-going examination of current arrangements which were considered, in part, to be inadequate. Particular reference was made to the Sizewell B PWR storage ponds which currently hold 300 tonnes of spent fuel and which will, by the time of the plant's closure, hold 1200 tonnes of this zirconium-clad material, prone to spontaneous ignition under extreme conditions and which represents a prime terrorist target. This demand for a 9/11-proof review has apparently been side-lined and overshadowed by the desire for progress on site selection, albeit on the principle of voluntarism, and repository delivery.

Given the weight of opinion recorded in CoRWM's report on the need to reduce uncertainties, including the health impact of the long-term operation of a repository, public concerns will not be satisfied by insubstantial remarks such as "further research will be carried out.....to reduce uncertainties" (paragraph 3.21 of the MRWS consultation document). The Government needs to make public a commitment to carry out R and D and to be open about what issues will be examined, who will be involved, the manner in which those involved have come to be selected and what requirement will be put on the NDA and Government to implement the findings of such an R and D programme. Only in this way can CoRWM's recommendation that the status of disposal as the best available option be tested.

Risks to MRWS

The sign-off documents will stress the integrated nature of CoRWM's recommendations and that disposal cannot be progressed independently. In my opinion, a sensible interpretation is that R and D should come first, something that the Scottish Executive's decision not to support the consultation on disposal appears to recognise. CoRWM has warned against 'cherry picking' its recommendations and the consultation runs the risk of challenge. You will be aware that Mr Justice Sullivan's judgment on the Energy Review included his pronouncement that the Government has once already misused CoRWM's recommendations.

I therefore call on you, as the Minister in the lead on the MRWS programme, to advise your officials that public support for disposal is not as robust as it might first appear and that the apparent enthusiasm for disposal is based, in part, on support for a management option which promised two contradictory things – 'removal of burden' and 'retrievability' - and a programme of comparison which was necessarily based on the unreasonable assumption that a repository will be able to retain and isolate waste from the biosphere for hundreds of thousands of years.

It is an inescapable fact that the majority of the public consulted voted for retrievability of waste - either directly through a desire for storage or indirectly through the assumed 'retrievability' characteristic of phased deep geological disposal. The ability to retrieve waste is more correctly, and

in my view, uniquely, attributable to storage and not to a disposal option. I believe, given a more direct choice and not one which was clouded by a disposal option unrealistically offering retrievability, the public would opt for secure, shallow-subterranean storage. When these issues are aired in the discussions following the identification of a volunteer community – should that situation arise – the task facing the NDA and the Government will become that much more onerous especially in the absence of an R and D programme to address the wide range of scientific and technical uncertainties openly and transparently.

Given these issues, I would ask you, as a matter of urgency, to require your officials to provide concrete information as to how an R and D programme examining the uncertainties associated with disposal will be conducted as well as details about how, when, by whom and with what requirements for action on the recommendations the storage review will be conducted. I would further urge you to ensure that these details are made public in the most visible manner possible and commit to a full and open debate in respect of implementing and responding to the findings. There are strong views held by the public on all the issues raised above and if MRWS is not to suffer the fate of the 1997 RCF inquiry, these are matters which must be attended to forthwith.

I am copying this letter to the relevant Ministers at Business, Enterprise and Regulatory Reform, Scottish Executive, Welsh Assembly Government and the Department of Environment, Northern Ireland. I am also sending copies to green NGOs, former CoRWM members, regulators and selected media.

Yours sincerely,



Pete Wilkinson
Director