Response form

Please use this form to respond to this call for evidence on Managing Radioactive Waste Safely: Review of the Siting Process for a Geological Disposal Facility.

The closing date for the submission of responses is **10 June 2013**.

Responses can be returned by email (preferable) or post.

Email address: radioactivewaste@decc.gsi.gov.uk

Or by post to: The Managing Radioactive Waste Safely team
Department of Energy and Climate Change
Room M07
55 Whitehall
London
SW1A 2EY

Name	REDACTEDREDACTED
Organisation / Company	REDACTEDREDACTED
Organisation Size (no. of employees)	REDACTEDREDACTED
Organisation Type	REDACTED REDACTED
Job Title	REDACTED REDACTED
Department	REDACTED REDACTED
Address	REDACTED REDACTED REDACTED REDACTED REDACTED REDACTED REDACTED REDACTED REDACTED
Email	REDACTED REDACTED
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Fax	

Would you like to be kept informed of developments with the MRWS programme?	Yes
Would you like your response to be kept	No

confidential? If yes please give a reason	

The Government is interested in your views on the geological disposal facility site selection process outlined in the 2008 Managing Radioactive Waste Safely (MRWS) White Paper. To assist us you may wish to consider the following issues in your response:

- **What aspects of the site selection process in the MRWS White Paper do you think could be improved and how?**
- **What do you think could be done to attract communities into the MRWS site selection process?**
- **What information do you think would help communities engage with the MRWS site selection process?**

DECC Evidence on radioactive waste disposal

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7 June 2013

1) What is the goal ?

The desired aim for radioactive waste disposal in the UK changes through time. During the last comprehensive publicly available review by CORWM1, the goal was to identify and develop a secure site for long-term disposal of intermediate level waste, possibly with additional high-level waste. In the recent past, during the course of MRWS, the publicly stated goal appears to include spent fuel and plutonium in this inventory. It remains unclear if military waste will be separately identified. Secure disposal in the UK appears to be legally defined as an excess death rate of one in 1 million or less for the affected population during the next 1 million years. There is an unclear position on retrievability of waste - is that condition satisfied by emplacement during many decades, or should retrievability be specifically engineered to be feasible at 500, or 10,000, years into the future ? It is also unclear which waste should be stored, a precautionary approach implies including ILW, HLW, SF and Plutonium. However it is possible that (currently un-developed) new technologies may be able to utlise HLW, SF and Pu. It is at present necessary to take a dual approach to design fro ILW, and to design for the hotter high activity wastes, but also to anticipate that some wastes may not enter disposal. The defence within the UK that SF or Pu “is not waste” is playing with words.

2) Origin of the radwaste

CORWM 1 was quite clear that discussions on waste disposal should include both legacy waste, and waste anticipated to arise from the operation and decommissioning of the existing fleet of nuclear reactors and other facilities in the UK. This definition was adapted under MRWS, to include the potential for storage of all future waste arising is from a future reactor fleet. That expansion of inventory created doubt and suspicion amongst many public participants. CORWM1 had no geoscience input, and very little science input. So the technical criteria fro candiate site seach, and the path way to that were not fully planned. By contrast although CORWM 2 contained a lt of science and technical expertise, that advisory body became very compliant to Government wishes, only influencing detail, not fundamental policy.

Even within the existing inventory the waste is not constant. During the course of MRWS a quantity of HLW and Plutonium was switched-in by UK government, in exchange for repatriation of some non-UK waste. That also created doubt and suspicion in public observers.

It is not clear what the government attitude is towards high-level waste, spent fuel, and plutonium. These categories of waste can make the search for, and engineering of, a disposal site extremely difficult. Yet, these are all potentially useful sources of radioactive fuel. Global research may continue to develop reactor types capable of reusing suitably processed and packaged wastes. In such a case, the GDF may be needed only for ILW. A clear, and durable, adaptive strategy on this waste inventory would be useful.

3) Transportation, surface storage and timescales

It is frequently stated that about 75% of existing radioactive wastes are held in West Cumbria. That is often coupled with a statement that disposal is urgent, and an implicit message that transportation is dangerous. It is not clear how compelling are any of these arguments. Waste has clearly been transported to West Cumbria from all over the UK, and the transportation grouping within NDA proudly assert their unblemished record. If any site lies out with the Sellafield boundary, it would imply that transportation to full safety standards is required even if only for a 1 km journey. It is hard to reconcile these observations with the implication that transportation is impossible. Consequently, either access to disposal has to be from within Sellafield, or all parts of the UK are available. Additionally the remaining 25% or more of committed wastes will still need to be transported.

A GDF is likely to become a national facility, costing between £10 billion and 30 billion. Consequently, such a site designed to last for 1 million years, should be chosen for long-term reasons, not simply because existing waste happens to be located at that position, for reasons of location which are founded on

remoteness of Windscale during World War II.

In any situation, it appears inevitable that processing, and packaging, of existing wastes will take many decades. Many of the surface storage facilities for UK waste are in a poor state, and some are notoriously abysmal. Much greater effort is needed towards rapidly providing secure storage capable of 100 to 200 years of design life, and also capable of withstanding malicious or terrorist activity. Some of these may be underground at shallow burial

Even on the most optimistic timescales, construction of a geological disposal facility is unlikely to start before 2030, and could be as late as 2070. Transporting waste to emplace in a GDF will take many decades. The public expression of these plans and strategies managed by NDA, does not seem to fit with the expression by DECC of the urgency of MRWS and several political statements underpinning it. MRWS will take longer than 6 months, or 2 or 3 years.

4) Propositions for disposal

Several industrial nations who use nuclear power have taken multi-decade timescales to identify candidate sites. The disposal concepts usually involve multiple layers of containment from engineered and controlled near field, close to the waist, including carefully chosen attributes of far field containment relying on deep geological factors. Several nations have decided to construct underground rock laboratories to make directly relevant in situ testing, and also have undertaken national campaigns of drilling or subsurface investigation to obtain contextual data. Neither of national contextual data, or dedicated underground rock laboratories appear to be a feature of the NDA proposition in MRWS. It is hard to understand how a unique UK proposition for combined storage of ILW with spent fuel can be sensibly located without additional scientific investigation.

5) Concept of near field and far field

Disposal of radioactive waste is a uniquely difficult and publicly contentious problem. There is no other activity which has to assess multi-billion pound costs fro a national facility, which lasts for one million years. If a design failure occurs, it is clear from existing experiences ranging from Chernobyl, to Dounreay shaft, to Windscale fire, that remediation and cleanup of unwanted movement is extraordinarily difficult and costly. Consequently all disposal propositions include an engineered near field close to the waste, surrounded by a carefully chosen far field suite of geological conditions.

Confidence in engineering claims for robust and high performing designs are hard to believe. Nothing has been built by humanity to last even part of these timescales. Also, the record of disasters such as Windscale fire, Three Mile Island, Chernobyl, Fukishima, shows all-too clearly that risks calculated at 1 in 100,000 or less are much more frequent than anticipated. Recent discovery that copper waste canisters may be much less durable than anticipated, is a good

example, The discovery was made by independent Swedish academics, unfunded by radioactive waste industry, showing the public value of independent scrutiny and parallel practical science work.

It appears that the UK has gradually evolved a proposition that only the near field is significant to containment, and the performance of the far field is merely to contain the near field engineering. This is regarded as false, and falsifiable, by the history of unexpected performance discovered in both near field design, and in far field conditions in other European countries. Consequently both of near field and for field are essential requirements, which are needed to meet the one in 1 million risk stipulation. Therefore excellent far field containment is needed, which can function to provide full containment, independently of the near-field.

From this short, but deeply important, argument on public perception, it follows that only candidate sites which have the prospect of excellent geological containment are eligible for detailed investigation. This was an essential part of CORWM 1, but has been gradually degraded in the UK, maybe by the evolution of internal corporate conversations within NIREX and NDA.

6) Generic problems

Many aspects of radioactive waste disposal are well identified, but remain essentially unsolved. These include A) the generation of gases from the waste, and from radiologists of water - and the requirement to leak gas pressures, whilst also excluding large groundwater fluxes. B) heat arising from waste, , especially HLW and SF, causing changes in near field containment properties, and in far field groundwater circulation. C) chemistry of groundwater requiring to be both reducing and alkaline, is an uncommon natural condition. Selection of candidate sites can be specified to have groundwaters which assist with engineered containment. D) groundwater flow should assist containment by being predictable, and slow in a direction away from biosphere. E) geological setting and architecture should be simple, to enable accurate prediction for construction of a GTF, and especially for minimal change during long-term performance assessment.

Generic problems in radioactive waste disposal need to be considered and mitigated, by choosing helpful far field geology. This restricts the search to regions of the UK known and mapped to be conducive. These have already been reported by BGS to Nirex and NDA during the 1980’s and subsequently. Rapid substantial progress in identifying regions can be made rapidly. Obtaining more detailed analysis, can be quickly undertaken within a few years, by using more modern data held in the National GeoScience Archive. Re-surveying selected areas of the UK is also possible by modern geophysical surveys, combined with drilling of deep scientific boreholes. Such a campaign, focused on selected regions could cost £100-400M. During the past 40 years of offshore exploration, abundant additional data exists, and it is surprising that

the offshore remains excluded for radioactive waste storage, when similar offshore areas are accepted to be viable for CO2 disposal.

7) Focusing on west Cumbria

Since the 1980s, there has been a persistent focus by UK government on attempting to create a GDF in West Cumbria. The present MRWS was the second major public rejection of such a site, essentially for technical reasons. Continuing to focus on West Cumbria may be politically attractive, but is scientifically and technically unhelpful for the following reasons 1) The attractiveness of West Cumbria appears to rely on the perceived captive workforce and public endorsement. However this MRWS has also clearly shown that these publics have very little knowledge of radioactive waste disposal, and consequently are not technically equipped with knowledge to make decisions. 2) a detailed and extensive adversarial planning enquiry during the 1990s definitively rejected both a specific site within West Cumbria, and the entire West Cumbria region. Spasmodic attempts to develop a GDF beneath West Cumbria persistently waste time and public money. There is no DECC institutional recognition or DECC memory of these failures. 3) Founding the development of the GDF on the existing Cumbria workforce brings with it allegations of a poor safety culture and erratic achievement in delivering and operating large complex projects to time and to budget. 4) The benefits of nuclear power have apparently not flowed to west Cumbria, which is one of the least affluent parts of the UK; any future MRWS benefits package would usefully ensure that genuine wealth transfers to the host communities and host region.

MRWS process

It is appreciated that Government tried to design a participative process. However this was fatally flawed, for reasons which include conflicted composition of MRWS ownership, inability to examine scientific and technical factors, rapid timescales and obscured and withheld rights to proceed or to withdraw.

Residents are temporary in the face of a facility which lasts for up to a million years. And siting rapidly, for political purposes may be poor Value for Money, if compliant residents live on a site which could be engineered to be safer with large expense, contrasted with other sites where residents live above sites which are technically easier to develop.

The separation between Government DECC, NDA developer, and MRWS as agents became increasingly difficult to determine. Public engagement has to be explicitly distant from Government and developers. A new organisation independent of DECC is required.

Important features for the future may include

i) operators of MRWS should be clearly distinct from UK government and

developers.

ii) re-examining the existing national UK appraisals of plausible regions for deep disposal of radioactive wastes.

iii) undertaking a tactical and strategic engagement of information with regional and local governance bodies. This may take several years to raise the level of understanding about radioactivity, risk, and construction.

iv) a right to withdraw has to be clear and unambiguous

v) the representation of region, or of communities, needs to have much greater democratic accountability both to the electorate of that community and to the wider region. The definition of,and representation from, a community needs careful inclusive identification.

vi) Prior information on science and technology and social factors, as well as information generated during the MRWS process, needs to be openly available, unlike in this recent MRWS

vii) In this recent MRWS, the real debate, on geology, was offered to MRWS, and rejected on several occasions. Consequently the real debate took place in public, outside of the MRWS process. MRWS needs to be able to tackle technical and scientific disagreement and make progress, rather than simply recording a difference of opinion.

vii) Expert advice and review, extending explicitly to the extent of undertaking replicate research, is required to advise communities separately from the official MRWS information packs. Such expert investigation can probe both the official MRWS information, and also probe into the opposing views. It is very likely that any candidate sites will meet opposition, so that a process enabling agreement and reconciliation, rather than battle and exhaustion would be much more helpful.

viii) clear conditions for success are required, rather than the assertions of potentially suitable performance. Such conditions could include numerically defined risk targets, defined subsurface flow rates groundwater flow volumes, suitable geochemical ranges of groundwater, acceptable temperature ranges and heating rates, surface road access, surface construction impacts and duration.

ix) candidate sites need to be clearly defined at an early stage, rather than fuzzy discussion of regions to be investigated.

x) valuable surface areas need to be explicitly excluded e.g. National Park, SSSI, AONB. The areas included and excluded are important for the clarity of the boundaries for search.

xi) greatly improved democracy and representation is needed, because sites

will ultimately be developed at local level, not at regional Council level. In the recent MRWS, the staff serving on the MRWS were very similar to those making the final decisions, and excluding most other councillors, and all of the public. There are ramifying conflicts of interest. It is not surprising that MRWS managed to convince the decision-making Councillors that development should proceed, as these were the same people. That does not work.

xii) interpretations of information generated during MRWS were very debatable, in particular the MRWS communication of public opinion polling was frequently challenged, as being incorrect. MRWS neither acknowledged nor adapted to these critiques. Credibility was lost.

Replies to Questions: Selection of site for MRWS

1) A new organisation is needed, which is not conflicted by the development aims of DECC or NDA to provide new nuclear power plant, or military purposes. A future site search "MRWS" could perhaps be operated by such an organisation. But, site search is likely to be even more independent and less conflicted, if "MRWS" is again separate from the nuclear waste organisation.
2) The duration of site search process may take 5 years, but more probably 30 years, by analogy with peer-group EU nations.
3) If co disposal of ILW with HLW and SF is required, then additional basic and fundamental research needs to be undertaken, including at site-specific level. This in itself may take 10-20 years.
4) Generic problems in radioactive waste disposal need to be solved: eg gas generation, heat, groundwater flow, groundwater chemistry, predictability into the far future, extreme difficulty of remediation from any leaks.
5) Settings offshore and near-coastal need to be considered. If a site is secure, leakage into the ocean is not predicted so disposal could be viable – legal definition needs attention.
6) All of 1 – 6 contribute to a process of building public consent through many years and decades. But 1-6 of course are insufficient on their own.
7) West Cumbria has been persistently rejected on scientific and technical criteria. Future searches should look elsewhere, and not return to onshore Cumbria.
8) Geology comes first, not last. Several criteria must <u>all</u> be satisfied for a potential GDF. These include excellent far field geology, to enable long-term prediction; the possibility to obtain public agreement of communities either by the absence of public residents or by progressive long-term education; technical containment feasibility resilient against low probability outcomes; legal permission.
9) Multi-year engagement by a new radwaste organisation (currently by DECC), to advise candidate communities on their (un)suitability for waste disposal.
10) Identify multiple candidate sites (say, 6 – 8) in outline. Reduce to say, 2-4 by selection of the published and newly acquired information. These may each be initially investigated by remote sensing geophysics (eg seismic) modelling and test boreholes. It is likely that extended site-specific testing

by underground laboratories will be required. This may be a 10-30 year programme.

Attracting communities to engage in MRWS

11) Transportation of radioactive waste by road, rail, or shipping, is safe and secure, and has been practised for many decades within the UK without incident. The whole UK has potential to be considered to solve this whole-UK legacy.

12) Creation of a new and different “disposal agency” independent of pressure from DECC or NDA to promote nuclear development.

13) Selection of multiple candidate sites is important. Obtaining enough information to assert “suitability” may take several years, rather than needing to be completed within months. Construction of a rock laboratory may be necessary, at the proposed locations, or at analogous UK locations. Engineered containment on its own, is excellent, but is insufficient to provide guarantees. Excellent understanding of surrounding geology and groundwater is needed, amongst a swathe of detail to enable prediction.

14) An essential action, is to create and fund a significant independent advisory body, which is capable of replicate research to distinguish between propositions advanced by developers or objectors. This body could be funded at 10% of NDA total budget. This would advise and work for Local Authorities, affected communities of interest or communities of geography, or affected publics. This empowers community information and representation – to build trust.

15) Public education on risk, radioactivity, disposal, time.

16) Definition of who communities are, and that there is a right of withdrawal enshrined in primary law. Conflicts of geography, size, administrative structure, local representation and local democracy need to be resolved.

17) Clear definition of what the “benefits” to a community are, and how the benefits can be shared amongst the local community and the regional community affected by a GDF

Information to help communities engage with MRWS

18) The waste inventories should be defined as legacy and committed waste, not including unknown quantities of future waste.

19) Local authority boundaries will not be reconfigured to obtain a favourable vote.

20 Much longer availability of time within “MRWS”, and technical information to enable informed debates to examine both the proponents and the opponents information. There have three attempts in the UK at “rushing” IGS drilling in the 1970’s / 80’s, Nirex Longlands Farm mid 1990’s, MRWS 2013. All have failed, and all in one place.

21) Explicit lack of control by DECC or NDA .

22) Full technical information sets of previous technical, academic, and international work to be available and catalogued – open web access.

23) Very clear numerical criteria parameters for GDF pass or fail, for example: predictable geology, groundwater, Eh, flow rate, pH, temperature, retrievability.