

REPORT OF CORWM STAKEHOLDER WORKSHOP ON R&D FOR THE LONG-TERM MANAGEMENT OF HIGHER ACTIVITY WASTES

CoRWM Members and Secretariat

Introduction

1. This workshop was held in the IBM/Defra Innovation Centre in Reading on 9 September 2009. Its primary purpose was to discuss a draft of CoRWM's report to Government on Report on National Research and Development for Interim Storage and Geological Disposal of Higher Activity Radioactive Wastes, and Management of Nuclear Materials (CoRWM document 2543, dated 27 July 2009).
2. This was an invitation-only event. Invitees were people whom CoRWM had met during the course of its work in 2008 and 2009 on the topics covered in the report, some of whom had commented on an outline of the report. Attendees are listed in Table 1. They had all been sent the draft report in advance of the meeting.
3. The format for the day is shown in Table 2. After introductory remarks Bill Lee explained the background to the report and CoRWM's objectives for the meeting. These were to hear the views of participants about the topics in the report and, in particular, their views on the conclusions and recommendations in the report. A short plenary session at the beginning of the day gathered participant's general views on the draft report, especially on the recommendations. Sessions were then held on sections 3-6 of the report, with a concluding session on CoRWM's conclusions and recommendations at the end of the day. A short voting session on R&D priorities was held after lunch. The attendees were split up randomly across 7 tables, and each session was broken down into a 20 minute round-table discussion on each topic, followed by the feedback of their main point to a plenary session. The rest of the group could then comment on these points. During the day participants could place 'post-it' notes on a board to raise 'other matters' that they thought were important.
4. The sections below summarise the main points made in each plenary session. Each table also had its own flip chart to record the points it discussed. These notes have been typed up and are shown in the annex at the end of this report.

Plenary 1: General Views on Draft R&D Report, especially Recommendations

5. Individual participants commented on CoRWM's six recommendations in the report, which were displayed on large posters around the room. Participants were invited to place "post-it" notes including their comments on the posters, which have all been recorded (page 9 et seq.). They were also invited to raise any general issues. Two points were made:
 - There was an assumption that research needed to take place in active facilities, but it was not clear why, or what experiments in such facilities would determine.
 - How much was R&D determined by the history of nuclear waste management in the UK, especially the failures since the 1970s?

Session 1: Management of R&D

6. Each table identified a number of issues (see page 14) and reported on their key points. Other participants then commented on these issues:

<i>Main issue</i>	<i>Participants' comments:</i>
Industry related R&D focussed on short-term needs and hitting targets	
International - wealth of academic and other information exchanges that could be exploited	<ul style="list-style-type: none"> • concern at misuse of intellectual property rights • Sweden and Germany encountering significant problems e.g. with KBS concept • is there worldwide co-operation or rather a tendency to guard commercial secrets?
Better targeting of R&D funding to focus on key uncertainties and improve our understanding of issues central to safe management of radioactive waste.	<ul style="list-style-type: none"> • UK including regulators have not always focused research resources in the past • though some useful work was done
Industry does fund some fundamental research in relevant skills areas.	<ul style="list-style-type: none"> • could say more about the need for more work at the fundamental / curiosity-driven end of the spectrum • be aware of DECC consultation on reform of HSE Nuclear Directorate and the potential implications for nuclear safety research
There is already some strategic co-ordination: need to identify what the gaps are	<ul style="list-style-type: none"> • recommendations are too general / ambiguous; say more about co-ordination gaps and what needs to be achieved
Need for a published R&D programme and discussion on what we need from it	<ul style="list-style-type: none"> • NDA RWMD hopes to publish its proposed geological disposal R&D programme later this year for comment • Can learn from Sweden which is good at clearly summarising research plans

Session 2: R&D Skills

7. Again, each table identified a number of issues (see page 16) and reported their key point. Other participants then commented on these issues:

<i>Main issue</i>	<i>Participants' comments:</i>
Other, non-nuclear industries have skills transferable to radioactive waste	<ul style="list-style-type: none"> • such as the oil industry e.g. reservoir mechanics, fluid flow
Mention extensive knowledge held by consultancies	<ul style="list-style-type: none"> • though many are getting on in years, and younger people need to be encouraged in
Need to attract more students, not just provide more courses / places	
Can't leave co-ordination to market forces, nor rely on Government	
Skills base a problem for other, non-nuclear sectors as well	<ul style="list-style-type: none"> • if the aim is to minimise exposure to radionuclides, one should not make matters worse by converting uranium into more radionuclides
Why change the draft recommendation - how otherwise to provide leadership?	
Mention research areas not just skills	<ul style="list-style-type: none"> • the Report should mention social sciences • it should also say more about the

<i>Main issue</i>	<i>Participants' comments:</i>
	implications of nuclear new-build

Session 3: Infrastructure Required for R&D

8. Again, each table identified a number of issues (see page 18) and reported their key point. However, instead of other participants commenting on each individual issue, all participants were invited to comment on all the issues raised or on other related issues. The comments are described below.

Main issue

Potential conflict between the need to retain active facilities for R&D, and the need to decommission facilities and cleanup sites

Is there more evidence to support the recommendation for an underground research laboratory?

NNL facilities should be made available based more on merit rather than ability to pay

A mechanism is needed to facilitate academic access to the facilities. Even so, NNL may have capacity limits, and alternative facilities may be needed as well. (See the comment above about run-down e.g. at Harwell and Dounreay and the need to revisit those proposals.)

Two underground labs may be needed - not necessarily in the UK - one in good geology and one in relatively poor geology

Before any underground facilities can be built in the UK, UK specialists need to gain a lot of experience of working in overseas facilities.

Participants' comments:

- the DIAMOND synchrotron is freely available; only commercial users pay
- Sellafield is a nuclear licensed site. One of the site licence conditions explicitly forbids third parties working in the facilities without the explicit approval of the regulator. The NNL is keen that access to the facilities is granted and is currently working with Sellafield Ltd (the licensee) and the NII to enable appropriate arrangements to be put in place to facilitate access by the University of Manchester, the first such organisation to formally request such access.
- Some parts of the relevant building at Sellafield have yet to be commissioned. At the moment capacity is not a constraint.

Plenary 2 - Participants Indicative Views on R&D Priorities

9. This was a quick 10 minute exercise. Participants were asked to prioritise the ‘urgency to start’, ‘ultimate importance of resolving’ and ‘value of knowledge per £1 spent’ for the following topics: waste conditioning and packaging, storage systems, management of spent fuels, plutonium and uranium and geological disposal and storage systems. They were given seven ticks each for each set of questions (21 in total) and asked to tick boxes on each wall chart depending on how important they thought the topic was. The full results are recorded on page 19.

10. To summarise, for 'urgency to start' waste conditioning and packaging had most votes, management of spent fuels etc and geological disposal were joint second and storage systems last. For 'ultimate importance of resolving' management of spent fuels etc and geological disposal topped the poll, with waste conditioning and packaging next and storage systems fourth by a considerable margin. For 'value of knowledge per £1 spent' the order was waste conditioning and packaging, management of spent fuels etc, geological disposal and storage systems. It was recognised that the results reflected the backgrounds of those present.

Session 4: Specific R&D Issues

11. Following table discussion, tables presented all their findings (see page 19) and there was general discussion. This included debate on whether the section should be moved to an appendix. Several but not all tables supported this. These points were made in discussion:

- The Report should refer more to research topics rather than issues.
- The Letter of Compliance process gave a false sense of security and discouraged research in some areas where it might be needed.
- The Report under-played work already done on geological disposal and implied that the science was poorly understood. It could summarise what was already known
- It should say more about ethics and other generic issues.
- Are there other topics? These were not comprehensive. If they were just examples, that should be made clearer.
- There were large volumes of graphite; was more R&D needed?
- R&D was needed on volume reduction and segregation.
- For each issue, the Report could comment on the completeness of previous work and the urgency of doing more including a risk-based explanation. There should be at least an indicative list of gaps.
- In each case, it should set out the implications of not achieving a successful result. This should not be left to Government.
- Several statements needed more supporting evidence.
- R&D was needed on package inspection.

Session 5: CoRWM's Conclusions and Recommendations

12. The facilitator asked participants (in pairs) to record on the same wall charts used in plenary 1 any further comments or concerns they had on the recommendations, now that they had heard the discussions during the day. He also asked participants to highlight any outliers with a green arrow. These are listed below.

Recommendation 1

- Add after first sentence, “A single UK R&D document should be produced, and updated at 3 year intervals as in Sweden.”

Recommendation 3

- How can the ‘waste’ side of the nuclear industry compete with the ‘excitement’ of new build and fusion? How to make decommissioning attractive?
- Skills strategy will only work if there are secure well-paid jobs at the end where the skills can be used.

Recommendation 5

- This recommendation is not justified in the report.

Recommendation 6

- Need to recognise that R&D is aligned to topics and not an independent activity.

Other Matters

13. From the points raised by participants (page 21), Bill Lee said that CoRWM is aware of the importance of social science in the MRWS programme and also of the need for R&D on transport. These issues were not covered in the report but it is expected that they will be part of CoRWM’s future work.

14. Participants were invited to make any final comments. These were:

- The recommendations should be punchier and better focused, including the need to press Government to encourage more young people into the subject area.

Bill Lee said that we would try but it is difficult in such a document.

- Can we expect, and can CoRWM afford further events of this kind?

Bill Lee said that CoRWM’s budget was increased this year. We would produce just one report to Government next year and a PSE event would be held to discuss the consultation draft.

Table 1 **List of attendees**

First name	Surname	Organisation
Andrew	Blowers	BANNG/NWAA
Cherry	Tweed	Nuclear Decommissioning Authority
Chris	Franklin	Natural Environment Research Council
Cleveland	Forty	AMEC
Danny	Vince	Department for Transport
Debbie	Harding	BBSRC
Ewan	Young	Scottish Government
Fred	Plumb	Ministry of Defence
George	Elder	Bradtec Decon Technologies
Gordon	Bryan	National Nuclear Lab
John	Harrison	Imperial College
Laura	Peacock	Atomic Weapons Establishment
Lydia	Meryll	SERA Labour Environment Campaign
Malcolm	Wakerley	DECC/DEFRA
Mark	Tearle	Magnox North
Neil	Smart	Nuclear Decommissioning Authority
Paul	Haigh	HSE RRG
Peter	Booth	Health and Safety Executive
Phil	Davies	
Pia	Sanyal	Health and Safety Executive
Rachel	Newton	Science and Technology Committee House of Lords
Rachel	Western	
Richard	Shaw	BGS
Roger	Yearsley	Environment Agency
Sam	Cox	Research Sites Restoration Ltd

Sam	Moore	Sellafield Ltd
Sean	Morris	Nuclear Free Local Authorities
Stuart	Hudson	Scottish Government
Terry	Joslin	Harwell Stakeholder Group
Tim	McEwen	Quintessa
From CoRWM		
Bill	Lee	CoRWM Deputy Chair
Fergus	Gibb	CoRWM Member
Lynda	Warren	CoRWM Member
Marion	Hill	CoRWM Member
Mark	Dutton	CoRWM Member
Rebecca	Lunn	CoRWM Member
Robert	Pickard	CoRWM Chairman
Adam	Scott	CoRWM Secretariat
Sam	Bains	CoRWM Secretariat
Simon	Mussett	CoRWM Secretariat

Table 2 – Programme for the day

From 9.00	Registration and coffee
10.00	Welcome Robert Pickard, Trevor Cooper
10.05	General introduction & questions Bill Lee
10.20	Plenary: general views on draft R&D report, especially recommendations
10.30	Session 1: Management of R&D (see Section 3 of draft report) Introduced by Bill Lee.
11.25	Coffee
11.45	Session 2: R&D skills (see Section 4 of draft report) Introduced by Fergus Gibb
12.30	Session 3: Infrastructure required for R&D (see Section 5 of draft report) Introduced by Marion Hill
13.15	Lunch
14.00	Participants' indicative views on R&D priorities
14.15	Session 4: Specific R&D issues (see Section 6 of draft report) Introduced by Rebecca Lunn
15.00	Session 5: CoRWM's conclusions and recommendations (see Section 7 of draft report) Introduced by Bill Lee
15.45	Next Steps Bill Lee
15.50	Chairman's Summary Robert Pickard
15.55	Feedback on the day
16.00	FINISH

ANNEX – FLIP CHART NOTES***P1 – Plenary: General Views on Draft R&D Report, Especially Recommendations***

Recommendation 1: CoRWM recommends to Government that it puts in place mechanisms to co-ordinate, at a strategic level, UK R&D for the management of higher activity wastes. Such strategic co-ordination is required within the NDA, between the NDA and the rest of the nuclear industry, amongst the Research Councils and between the whole of the nuclear industry, its regulators and the Research Councils.

Changes to wording to improve precision

- More accurate and specific wording. “CoRWM recommends to Government that it ensures that there is proper coordination at a strategic level...”
- ...“to coordinate, at a strategic level, UK R&D for the storage of higher-activity wastes on the one hand, and their disposal on the other.” Because the word “management” is ambiguous and confusing.
- Government need to “ensure” this happens. Stronger wording.

Additions to content

- *T. Joslin* - Disparate organisations tend to ‘pull apart’ and delay progress. A coordinated body is more effective and efficient. All skills and experience need to be brought together, rather than exist in ‘silos’. For example, RAL at Harwell are studying transmutation and Oxford Instruments also appear to have an interest. At present, they are both ‘outside the fold’.
- What would CoRWM recommend that this co-ordination look like?

Amendments to content

- Recommendation seems to misunderstand the way that Research Councils work. Might be useful to talk to them. Research Councils do not commission research – if we don’t get applications in this area we can’t fund them. No attempt to relate this to other Research Council priorities.
- No timescales for this - all recommendations.

Other

- How do you get the balance between independence and expertise?
- Need to avoid over-bureaucratic approach that would slow progress.
- Wording needs to include something on the outline for the essential criteria for such a mechanism and mechanism for funding.

Outliers

- Add after first sentence, “A single UK R&D document should be produced, and updated at 3 year intervals as in Sweden.”

Recommendation 2: CoRWM recommends to Government that it ensures that the Environment Agency and SEPA have the resources they need to commission independent research to support them in their regulation of the management of higher activity wastes.

Changes to wording to improve precision

- Resources should be more prescriptive: funds, people, right to levy?

Other Comments

- Need to avoid duplication of effort with transparent oversight by all interested parties.
- Prefer the wording of this rather than the amended version.

Recommendation 2 (Amended by Government): CoRWM recommends to Government that it ensures that the Environment Agency and SEPA have access to independent research as well as the resources they need to commission independent research to support them in their regulation of the management of higher activity wastes.

- Participants were asked to express their thoughts on the revised recommendation by ticking a box on the poster. The table below indicates their overall view.

<i>Definitely agree with revised wording</i>	5
<i>On the whole agree</i>	2
<i>Don't know</i>	1
<i>On the whole no</i>	1
<i>Definitely not</i>	0

Other comments

- Should be access to independent expertise in UK and overseas.
- Exactly what does access mean? Therefore, don't know. Original wording meant funding and manpower – we thought.
- This reads as simply an extension? What does it actually add that is different?
- Don't they have it already? If not, why not?
- I don't understand what this means. Wording is ambiguous.

Recommendation 3: CoRWM recommends to Government that it assigns to a single organisation the responsibility for providing national leadership and strategic direction for provision of R&D skills relevant to the long-term management of radioactive wastes.

Changes to wording to improve precision

- Lack of clarity here about “provision of skills” – are we talking about research capacity/capability generally or the desire of an Higher Education Institute (HEI) to follow a commercially advantageous pathway?

Additions to content

- NDA does ??? (illegible) Continuity of leadership (and governance) is important but retain openness to wide range of stakeholders' suggestions and knowledge.

Amendments to content

- There are factual inaccuracies on MoD related sites (e.g. AWE and dockyards) which I will correct by email (fig 1 and para 3.23). AWE is MoD owned. Devonport and

Rosyth are not MoD owned. But MoD owns the naval base at Devonport and is responsible for the nuclear liabilities at Devonport and Rosyth.

Other comments

- Can this be achieved? Should ‘interested parties’ work better together?
- R3 as written [in pre-circulated report] is fine. But, paragraph 14 suggests that the co-ordination should not be part of industry – how will this work? And what is the driver?
- NDA’s R&D strategy should provide a basis for coordination at national level. But better understanding of the role of research councils would aid interpretation and coordination on R&D.
- Should this be NDA supported by appropriate independent experts to provide a peer related function?

Outliers

- How can the ‘waste’ side of the nuclear industry compete with the ‘excitement’ of new build and fusion? How to make decommissioning attractive?
- Skills strategy will only work if there are secure well-paid jobs at the end where the skills can be used.

Recommendation 3 (Amended by Government): CoRWM recommends to Government that it [assigns to a single organisation the responsibility for providing] provides national leadership and strategic direction for provision of R&D skills relevant to the long-term management of radioactive wastes.

- Participants were asked to express their thoughts on the revised recommendation by ticking a box on the poster. The table below indicates their overall view.

<i>Definitely agree with revised wording</i>	<i>0</i>
<i>On the whole agree</i>	<i>0</i>
<i>Don’t know</i>	<i>1</i>
<i>On the whole no</i>	<i>6</i>
<i>Definitely not</i>	<i>7</i>

Comments for

- ‘Single organisation’ too prescriptive

Comments against

- Independence. Should the relevant body be independent (to some extent)? Like the Food Standards Agency
- Dislikes responsibility and focus
- How can Government provide leadership if it is not informed by objective, independent research?

Other comments

- What Government department has sufficient knowledge and understanding to provide this oversight role? – Availability of technical expertise?
- Need to put this recommendation in the framework of TOTALITY of nuclear industry skill requirement.
- R3. Recommendation is only relevant to radioactive waste. You could (and should) take the opportunity of commenting on the UK ‘intelligent customer’ base for the whole nuclear argument in the UK. Does the UK Government want to be an intelligent customer for civil and/or military nuclear or not?

Recommendation 4: CoRWM recommends to Government that it puts in place a mechanism to meet the national need for active facilities to support the full spectrum of fundamental and applied research relevant to the management of higher activity wastes.

Changes to wording to improve precision

- Remove ‘fundamental and applied’.
- Agreed. Would be good to get fundamental and applied revised from report.
- Early workshop comments on the continuum of research from fundamental to applied is relevant here.

Amendments to content

- Clarification of what ‘active’ facilities are aimed at. Do the facilities need to be active?
- What need to understand how sufficient evidence would be compiled using only non-active stimulants.
- Government taken major steps in appointment of NNL management. Business case required.
- Traceability between recommendation and report content not clear.

Other comments

- Need DECC and BIS to agree with NDA how this can be achieved over next 25 years.
- Agree need for active facilities but also need to improve across to existing facilities.
- Where is the national need set down clearly?
- Ensure university and Research Councils not de-barred artificially from National Nuclear Laboratory.

Recommendation 5: CoRWM recommends to Government that a specific stage be identified in the MRWS programme in which underground R&D is undertaken. This will involve the construction of an underground research facility at the site of any proposed GDF.

Changes to wording to improve precision

- “CoRWM recommends to Government THAT IT ENSURES that a specific”

Additions to content

- CoRWM should recommend commissioning a scientific analysis of the Nirex Inquiry report and what progress has been made since the inquiry – comes before recommendation.

- Research on active waste streams to imply that the waste should be accessible to allow future development in its treatment. *T Joslin*
- Whilst what is said is true it is insufficient as, unless the UK takes part in URL work before this stage, there will be no experience of carrying out such work.
- Important that underground facility doesn't damage info for safety case.

Amendments to content

- Do we need an active URL to investigate post closure issues
- Recommendation 5 contradicts recommendation 3 of geological disposal CoRWM report.

Other comments

- The case for (or against) underground R&D needs to be made by the duty holder.
- How can RWMD justify no RCF when the 98 public inquiry set its stall out on how essential one was.
- URL has major role for public perception which may be more important than the science that will be done in it.

Outliers

- This recommendation is not justified in the report.

Recommendation 6: CoRWM recommends to Government that it ensures that a wider range of stakeholders than to date will be involved in establishing R&D requirements for the long-term management of higher activity wastes and that accessible information will be made available to the public about R&D needs, plans and progress.

Changes to wording to improve precision

- Who were the previous stakeholders and who should be included?

Additions to content

- Clarify whose R&D requirement UK's? NDA's?

Other comments

- Some doubt as to how wider stakeholders will be able to make a contribution to specifying R&D needs (as distinct from BPEO and broad direction).
- This will be hard to achieve because of the technical nature of the topic. To be helpful careful management will be required.
- This involvement in establishing requirements needs to be at an appropriate level – set requirements not prescribe how tasks will be carried out.
- But not so wide as to become unmanageable. Too many voices become a clamour (or even a protest).
- How do we get people and politicians to prioritise long-term issues?
- What range of stakeholders has been involved to date? Please involve the wider (not just nuclear/geo) research community.
- What would be the implications for accountability?
- Will this require consensus? If so, it will be made very difficult.

Outliers

- Need to recognise that R&D is aligned to topics and not an independent activity.

Session 1: Management of R&D

- Chapter 6 is very good – but not ‘married’ up to earlier sections (e.g.3)
- Need to be chemically aware.
- Need to adopt ‘phased’ approach.
- Rec 6 – limits to ability of broader stakeholders to establish R&D requirements (rather than guide).
- If funding is very tight to meet short term needs, longer term opportunities to improve are not pursued.
- More central ownership of R&D needed, possibly by NDA.
- Ability of supply chain to deliver R&D is actually quite limited.
- Recommendation 6 – I would expect that stakeholders should be involved in resolving topics rather than just R&D.
- Encourage Government to implement recommendation as rapidly as possible in order to realise costs savings at an early stage.
- Ch. 3.3 – invest more in these stated organisations. Some are already working on nuclear waste issues over the long term. Perhaps coordinate their efforts.
- Chicken and egg. Would more R&D into different geologies encourage more communities to volunteer?
- Ref: GDF – Ensure that all invitations to potential host local communities are copied to all elected members. Ensure that invitations are not sent out just prior to local elections.
- “NDA don’t have a clue, because the people at the top have been parachuted in”. “I know who they are and I know that they don’t know anything”.
- The need for a coordinating mechanism that is transparent and the need for a follow-on mechanism to allocate funding responsibilities.
- Industry support fundamental research through supporting EPSRC ‘managed call’ consortium.
- Figure 1 illustrates how complicated the management of R&D is.
- With R&D funding from RCUK we need to move beyond the current state of infighting in assessing proposals (i.e. use independent reviewers).
- Is there an example from other industries of a better model for managing R&D (e.g. the EPRI – Electric Power Research Institute - in the US).
- Need a process to make available historic research.
- Need a process for sharing of future R&D.
- Need to make sure that the report makes clear that strategic coordination is proposed at UK level, i.e. sits above NDA, RCUK, HSE etc.
- Figure 1 is a damning indictment of the state of R&D in the UK.
- Is EDF now part of the UK’s knowledge base?

- BGS – The importance of BGS in the context of deep disposal should not be underestimated – but there are other organisations that have knowledge – and how is information shared.
- We are concerned that university departments that wish to undertake R&D (in waste management or something else) no longer have the (undergraduate) nuclear skills base and it will take time to redevelop such a skills base.
- National Nuclear Lab – We are encouraged by the establishment of NNL and await positive results in due time. A decision on which parts to put into service is urgent.
- There needs to be a greater significance given to a developed strategic vision to both short and long-term R&D led by NDA.
- The uncertainty around what will happen (e.g. storage of fuel or reprocessing, long term storage or very long term storage) may delay commitment to commission and undertake R&D. A decision being made would give clarity and may prompt R&D.
- Someone overseeing research needs would be useful but: who and can you get independence and a suitably qualified experienced person?
- The outcomes of the Nirex inquiry on Cumbria still need to be investigated to determine whether a GDF is suitable. Cumbria may not be the most appropriate location – 8 years lost again!
- More industry R&D needs to be put into public domain – commercial ‘excuses’ are usually overplayed – it needs transparency and challenge from more general stakeholders.
- A lot of research is funded by the EC. Historically the UK has not been very good at involvement in these projects (compared to French) co-funding etc. Better coordination would improve prospects.
- Recognition of work already done in 1980/1990’s in identifying priorities in applied and fundamental R&D - now there is a greater need for applied R&D. Generic work from UK and overseas programmes in past is still relevant.
- Research Councils fund a large amount of fundamental research which could be relevant to nuclear waste but is not focused on it and is not considered in this report.
- Fundamental and applied research on social science aspects of RWM are scarcely addressed in the report. Some research undertaken is not acknowledged. Social science is vital to understanding values, perceptions, acceptability of RWM. Need to look at research conducted by Research Councils and through international groupings (e.g. CARL).
- Para 3.50 – Report excludes comment on issues such as new build, life extension, future reactor systems and reprocessing. This results from a narrow interpretation of remit. Such issues are relevant to long-term interim storage and geological disposal. Exploration and justification of these omissions should be given and it should be recommended that R&D about those issues be undertaken.

Key Points

- Recommendation 1 – Be clear as to what the gap is in a strategic coordination.
- Recommendation 1 – be clear how this gap should be filled.
- There needs to be a published R&D programme like Sweden and France. At present we don’t know what RWMD are doing or thinking. There needs to be better discussion on what is required from a R&D programme.

- The Impression given that the industry only funds applied research may be misleading. Industry also funds fundamental research in relevant skills areas. There is a spectrum of fundamental research. Some is about the generation of fundamental data or an understanding of physical processes. Curiosity driven R&D is at an end of the fundamental research spectrum.
- There is an opportunity for CoRWM to influence HSE research by responding to the consultation on NSC by 22/9.
- International – should be highlighted in bullet points in 3.3.
- Significant concern that SLC/Industry related R&D is overly focussed on short-term business needs/hitting ‘targets’; Long-term is ‘someone else’s’ problem.
- Better targeting of R&D funding to focus on key uncertainties and improve our understanding of issues central to safe management of radioactive waste.

Session 2: R&D Skills

- We should recognise the ‘learning opportunities’ provided by active involvement of staff in projects outside of the UK. How can staff be ‘encouraged’ to return to UK.
- Please can there be greater recognition that the skills shortage applies across most of the nuclear industry (and not only waste management R&D).
- International – better recognition of possible skills/information available outside the UK might diminish the perceived skills shortfall in the UK.
- Any opportunities to pool expertise and skills across civil/military divide to address skills problems?
- We strongly agree with recommendation 3.
- There is going to be significant competition for people with the skills that will be used in waste management – highlight in the report.
- Further clarification by Government of NNL’s role if needed.
- The R&D strategy should be integrated into a larger-scale understanding of sustainability.
- Need to encourage more young people into science/engineering in the first place – encourage from primary school upwards!
- Fig 3 – change BERR, DIUS and add NERC.
- Carrot to attract people into ‘generic’ nuclear R&D will need an element of new build.
- Recognise need to provide technical training to safety community, including regulators.
- Careers guidance – expertise needed and broader understanding of disposal by the regional development agencies.
- Advanced training needs to target UK nationals or lose some of the benefit.
- Broader workforce development and inset training required for professionals in health/fire and other front line services to ensure new elements of risks are understood and planned for.
- Can we predict the needs in the future in isolation? – need push from Government to show industry will exist for people to go into.
- Currently there is a skills shortage, and direction at a strategic level is needed to resolve this.
- Is Government the right body to do this? Probably not. Need for an independent body? important.

- Not necessarily 'nuclear skills' needed. Need a range of skills across disciplines.
- No strategic requirement for universities to do a subject – need incentives in order to do so.
- Train-up or import skills?
- Knowledge management will be an important skill given the long timescales involved in radioactive waste management.
- Need to flag social science skills as an essential element in long-term radioactive waste management.
- EC training programmes not mentioned in report – e.g. PETRUS 2 €1.8m consortium in this area (French coordination). No UK involvement?
- Biological sciences, in particular, radio-ecologists are needed to provide a robust science base for reference biosphere models.
- Biosphere modelling based on discharges is based largely on different processes to those required for geological disposal and radionuclides entering the biosphere via ground water.
- Need change in Government funding of training for nuclear specialists. France has extensive programme for graduate/postgraduate training.
- How will the industry incentivise newly qualified graduates to join the nuclear field? How do we retain the current skills base?
- Role of RADREM/RWMS underplayed in coordinating R&D across Government. Regulators and industry produced status reports but they are unpublished.
- Sufficient skills need to be available across technical and social aspects of RWM to provide independent advice and support to regulators, communities and wider stakeholders.

Key Points

- Geological disposal – how will experience and knowledge of consultancies and consultants be used? The report scarcely mentions them? (Information exists in different industries, how can this be transferred and directed?)
- Include in summary – lack of R&D skills to support the MRWS programme is part of a bigger issue of less scientific graduates. Need to encourage science, engineering and technology in schools so that people then go on to further education in SET.
- Greater evidence of transferability of non 'nuclear' skills across, and its availability.
- Be more specific on whether this (4.42) is concerning overall skills or research skills.
- 2 serious omissions from report. 1. Need for research skills in social science areas both for generic and applied research. RWM is social and scientific issue. 2. New build (Government remit) raises a range of issues which will need to be addressed (storage, siting etc) by both social and scientific research and attendant skills.
- Any move to service long-term needs must NOT detract from servicing short term needs.
- Government is too vague in recommendation.
- Ensuring the availability of the necessary skills can't be left to the market. Coordination is required – not by Government.
- Why does the Government wish to change the recommendation not to have an independent agency considering relevant skills issues? How will it give the right leadership without it?

Session 3: Infrastructure Required for R&D

- Don't forget use of stable simulants – for small scale surface and for geological experiments underground.
- 5.47 needs to spell out URL in separate rock block from repository rock block may be needed for certain rock types (mudstone) and not other (salt).
- How will we train for analytical capability – where are the facilities?
- What is the position with respect to active facilities for handling trace quantities of radionuclides >NORM but lower than NNL levels?
- 5.42 - not sure it is true that there is no mechanism to fund research at NNL. Check research council response or check with EPSRC.
- Need to explore possible lab resources owned by commercial (mining?) operations. Do not assume it doesn't exist because it has not been inspected/regulated.
- Support and enhance existing active facilities – not create new facilities that would add to clean-up burden in future.
- URL would be useful for characterisation of radioactive waste disposal method and provide an end to building stakeholder confidence.
- A URL is important for public acceptability, perhaps more so than for research to demonstrate capability and provide confidence that 'we can do it!' Such a URL better if not linked directly to a future GDF.
- An analysis of the failed Nirex attempt to nominate Cumbria in 1997 should be made to determine if an underground facility should be researched into now.
- Implementer should do all research and development required to underpin safety case.
- Recommendation 4 – Government has put in place a mechanism for working in active facilities through establishment of NNL and actions on it.
- Support the need for an RCF that not merely focuses on site investigations but contributes to safety case development.
- Will a URL be best located in the exact footprint area or merely local in the same host rock.
- Would like to see more emphasis on storage facility R&D needs, particularly what can be done at sites other than the NNL.
- URL required to undertake R&D to support safety case.
- Current facilities are operated on a commercial basis. Some alternative mechanism needs to be put in place for academic research – subsidy? dedicated academic research facilities.
- Mechanism for investment for future equipment/facilities is required that includes university requirements.

Key Points

- What is stated regarding URLs is correct as far as it goes – but it is insufficient, as there is no mention of what happens before a URL is available at a prospective site.

There is a need for UK scientists to obtain the necessary skills in advance of a UK URL. This requires that UK scientists gains experience in other countries URLs.

- Access to research facilities is important for open competition on research proposals based on Government support for facility.
- Two underground facilities needed – a ‘good site’ (disposal site) for characterisation, a ‘bad site’ for research. The ‘bad site’ does not need to be in the UK.
- Should other active facilities e.g. B220.29 at Harwell be left ‘open’ for business, ditto university labs.
- Mismatch between needing active facilities available for future R&D and the current decommissioning and clean-up programme.
- Evidence for why a URL is really needed – not in the report.
- Lab facilities should be made available to all (on merit) not merely those who can afford it ‘highest bidder’.

Plenary 2 – Participants Indicative Views on R&D Priorities

Urgency to start

Waste conditioning and packaging	61
Management of spent fuels, plutonium and uranium	53
Geological Disposal	52
Storage systems	47

Waste conditioning and packaging:

- Priority on treatment to reduce disposal volume
i.e. Magnox dissolution, resin oxidation, graphite gasification, metal recycle.

Management of spent fuels, plutonium and uranium:

- Spent fuel rods are corroding in ponds of Pu/U oxides in dry storage
- Exercise is methodologically unsatisfactory – why these issues?

Ultimate importance of resolving

Management of spent fuels, plutonium and uranium	70
Geological Disposal	67
Waste conditioning and packaging	53
Storage systems	26

Management of spent fuels, plutonium and uranium:

- Management and governance needs a period of stability and predictability and knowledge transfer.

Value of knowledge per £1 spent

Waste conditioning and packaging	60
Management of spent fuels, plutonium and uranium	56
Geological Disposal	50
Storage systems	40

Session 4: Specific R&D Issues

- Section focuses on four key topics – non-experts will regard these as the only ones. Need brief list of all topics of interest/relevance.
- We need a report stating what we do know generally about GD. Based on e.g. HMIP programme.
- Gives impression that science of geological disposal is not well established – fails to recognize last 30 years worth of work in UK and overseas.
- R&D topics will become better defined only when a specific site is available for developing a geological disposal facility.
- R&D should inform/strengthen safety cases for radioactive waste management – needs to focus on uncertainties.
- Report dismissive of complexities of biosphere modelling. If we use reference models for biosphere why not apply same approach to geosphere?
- Move R&D requirements to annex – needs specialist knowledge more than rest of report. Keep key priorities in main report.
- Does the LoC for waste streams give a false sense of security that the material will be suitable for the GDF? Does this then lead to lack of R&D in this area?
- Section 6 should be “Some specific R&D topics” not “R&D Issues” – section should therefore be an appendix.
- Could CoRWM present its views on the R&D priorities?
- R&D needed on design and management of projects with a time scale >150 years – we have no experience of this.
- The focus for chapter 6 is not clear. R&D several dimensions which may need to be understood
 - Urgency
 - Complexity
 - Completeness

Are there issues on any of the topics? Purpose of the chapter not clear.

- Empirical v mechanistic: continuum not distinct.
- GDF design/geosphere characterisation issues are both appropriate and complete
- The level of detail presented in section 6 appears inconsistent with the remainder of the document – better to focus on the key points and collect detail of challenges in an appendix – or elsewhere.
- Section 6 should be a separate report with a summary only in this report.
- Naming research priorities/gaps has to be mentioned as a core piece of the report and not relegated to the appendix.
- No research into alternatives to a GDF.
- Graphite: is it possible to reduce the volumes and therefore the costs of storage by separating lightly active portions from lower level portions of the material? i.e. more research into graphite management?
- Section 6 should be moved to appendix; clarify why in the report.
- Concern over validation of statements in section 6.
- Highlight need for R&D on package inspection.
- Need to set out reasons why each of research needs are important (in terms of risk assessment).
- Needs sense of urgency – given that UK nuclear programme over 50 years old and these problems still not resolved.
- Need to state role of active facilities.
- Need to highlight in a transparent manner the implications of not achieving set objectives for each area of R&D.
- Continuity of funding over the long-term.

- Might be useful to assign responsible organisation against each of the itemised research topics, as is currently realised i.e. which organisation does which elements of R&D.
- Importance of segregation and volume reduction.
- Encourage R&D to make better use of the Waste Hierarchy so that volume for disposal is reduced.
- Include a less technical summary at the beginning of the section.

Session 5: CoRWM's conclusions and recommendations

See plenary 1 and outliers – this session was a continuation of plenary 1.

Other matters

- Important areas of research i.e. in social science, risk perception are not sufficiently recognised (Blowers).
- The importance of relevant research in non-nuclear areas that is relevant to geological disposal is not brought out in the conclusions and executive summary (Franklin).
- Transport not identified as a field for research – is this because it is not an issue? How about transport modelling for the future transport infrastructure? Transport is an important issue.
- How can one have confidence in geological disposal with the level of uncertainty described in the report? (Blowers). Proposed opposite view i.e. enough knowledge now to support geological disposal (Franklin).
- R&D associated with new build (social side) not addressed e.g. storage of spent fuel for >100 yrs.
- ESRC has specific group looking at social science aspects of energy (Blowers).
- CoRWM should recognise the possibility that it may turn out to be impossible to predict with sufficient confidence the risk associated with radioactive waste burial.
- CoRWM should recommend commissioning an analysis of the scientific uncertainties and technical deficiencies raised by the Nirex RCF Inquiry report and details of progress made since the report.
- We are packaging waste now but will the regulators allow it to be transported in 50-75 years time?
- **Comment on above point:** RE: transport. We can't predict this for 50+ years time. However 1. Activity/container will reduce over that time 2. Efforts are being made to increase activity per unit volume, thereby reduce waste volumes 3. More of a structural integrity matter and this can be overcome by over-packing.
- An analysis of the competitive higher education research environment is essential. Intellectual property right considerations and commercial confidentiality has to be addressed. No room for naivety on this! Specifications for commissioning can insist on collaboration (2 x HEIs do joint bid...)
- R&D into transport is of fundamental importance and it is needed now. If not started now we could well end up repackaging stored waste time and time again. S. Hudson Scottish Government.

- Review of the national facilities (NDA private (BE?) MoD) other facilities for decommissioning/disposal to see if any of their facilities could be used to rejoin, reduce and/or reuse nuclear materials.
- What body is considering the skills required for long-term strategic management? R&D on retrospective analysis of British Rail could be a starting point!