

Geology Seminar: notes from Monday 20 June 2011

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Background and overview

This information seminar was organised by the West Cumbria Managing Radioactive Waste Safely (MRWS) Partnership in advance of the first of the Partnership's assessment meetings. As part of the assessment process the West Cumbria MRWS Partnership needs to decide whether it is '*satisfied that sufficient areas are remaining in West Cumbria after initial screening to make further progress worthwhile*' (Criterion 2b in the Partnership's Work Programme). The seminar was organised to improve the understanding of Partnership members and the public about the geological issues that need to be considered with regard to that criterion. The seminar did not aim to reach a decision. The seminar was advertised in local papers, and covered in the media prior to the event. About 100 people attended overall.

Speakers:

- Professor Simon Harley, Committee on Radioactive Waste Management (CoRWM).
- Dr Adrian Bath, a member of the Criteria Proposals Group (CPG) Sub-Surface Exclusion Criteria for Geological Disposal of Radioactive Waste.
- Dr Cherry Tweed, NDA: presentation on why they believe that sufficient areas are remaining in West Cumbria after initial screening to make further progress worthwhile.
- Dr Jeremy Dearlove, Partnership peer reviewer: presentation on his assessment of the arguments presented to the Partnership by the NDA and Professor David Smythe.

The following handouts were provided in advance to registered participants and on the day. All are available on the West Cumbria MRWS Partnership website under the Documents section (reference numbers included below) or in printed form on request:

- Professor David Smythe: Why a deep nuclear waste repository should not be sited in Cumbria: a geological review 12 April 2011 – [Ref: j](#) (external documents section)
- Letter from CoRWM to MRWS Partnership – [Doc 162](#)
- Letter from Dr Jeremy Dearlove to MRWS Partnership: *Overview of Professor David Smythe's rebuttal of CoRWM's views* – [Doc 175](#)
- Letter from Tim McEwen commenting on David Smythe's paper – [Ref: k](#) (external documents section)
- Geological Disposal – Further information on geology for West Cumbria MRWS Partnership – prepared by NDA (Nuclear Decommissioning Authority) [Doc 167](#)
- Letter from Jeremy Dearlove commenting on NDA input above. [Doc 194](#)

Contents:

1. Brief overview of CoRWM presentation.
2. Dr Adrian Bath presentation (powerpoint slides).
3. Dr Cherry Tweed, NDA presentation (powerpoint slides).
4. Dr Jeremy Dearlove presentation (powerpoint slides).
5. Note on discussions at the meeting.

1. Brief overview of CoRWM presentation.


Professor Simon Harley outlined the role of the Committee on Radioactive Waste Management (CoRWM) in terms of providing independent scrutiny and advice on the management of radioactive waste. He stressed that CoRWM are not part of the 'implementation team', but that they can comment from a national perspective based on the staged MRWS process. He pointed out that a key point in CoRWM's letter to the Partnership (CoRWM Doc. 2902), and included in the background documents for the seminar) was the view that it is too early in the MRWS process to make broad statements about the whole area under consideration. He noted that in most cases current knowledge is based on interpretation of surface based data, but that what happens at depth can be quite different. Extrapolations are dependent on interpretations. In order to find out about prospective rock volumes for a potential site for a GDF (Geological Disposal Facility) more information is required, making it premature to decide that all areas are unsuitable. Finally he stressed that CoRWM would continue to advise on the rigour of application of the MRWS process, and maintain its independence in carrying out this role.

Full notes of this presentation can be found on [CoRWM's website](#).

2. Dr Adrian Bath presentation – slides

**Criteria Proposal Group (CPG)
exclusion criteria and the implications
for the Partnership's criterion 2b**

*Adrian Bath
Consultant
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Loughborough LE12 6SZ*



The slide features a title, presenter information, and a logo. The title is centered and reads 'Criteria Proposal Group (CPG) exclusion criteria and the implications for the Partnership's criterion 2b'. Below the title, the presenter's name and affiliation are listed: 'Adrian Bath, Consultant, Intellisci Limited, Loughborough LE12 6SZ'. The Intellisci logo, which consists of a blue circular shape with two green dots and the word 'INTELLISCI' inside, is positioned in the bottom right corner. A thin blue vertical line is on the right side of the slide, and a thin blue horizontal line is at the bottom left.

Introductory remarks

- My area of knowledge
 - geochemistry and hydrogeology
- Who I do work for
 - occasional advice and research for NDA-RWMD, including past membership of site characterisation advisory group and peer review of DSSC
 - site data interpretation for Nirex in 1990's (whilst at BGS and Golder Associates)
 - ongoing advice and research for nuclear regulatory authorities in Sweden and Finland on site evaluation projects
 - member of 'expert group' who advised DEFRA in 2007 on initial sub-surface screening criteria for excluding areas that are probably unsuitable for geological disposal of higher activity radioactive waste (MRWS White Paper 2008)

What I'm going to talk about

1. How and why the Criteria Proposals Group approached the formulation of exclusion criteria based on sub-surface characteristics.
2. Comments on West Cumbria MRWS Partnership's Criterion 2b (Are sufficient areas remaining to make further progress worthwhile?)

The 'why' and 'how' of CPG exclusion criteria

- Exclusion criteria for initial site 'screening' in MRWS Stage 2 were recommended by CoRWM (2006) and adopted by ministers
- Criteria were formulated by the CPG (eight geologists & hydrogeologists, chaired by Prof Peter Styles), were then reviewed by a Review Panel (CRP) chaired by Prof Howard Wheater (March – May 2007), were revised and then put out in June 2007 consultation on 'framework'

What are the sub-surface exclusion criteria?

	critereion	comments
Natural resources	coal (>100m), known deposits	intrusion risk
	known oil & gas & oil/gas shales	
	known economic metal ores (>100m)	
	committed wastes/gas disposal/storage (>100m)	
Ground-water	aquifers (volumes of rock having exploitable groundwater)	host rock not all or partly in aquifer or permeable fn
	shallow (<500m) permeable formations that might reasonably be exploited in future	
	specific deep (>500m) complex hydrogeological environments: karstic formations, source of thermal springs	

Some groundwater conditions are not excluded

hydrogeological condition	comments
deep (>500m) permeable saline formations (unless committed for wastes disposal / gas storage)	no potential for exploitable groundwater resource
formations adjacent to exploitable groundwater	where potential host rock volume would provide adequate isolation

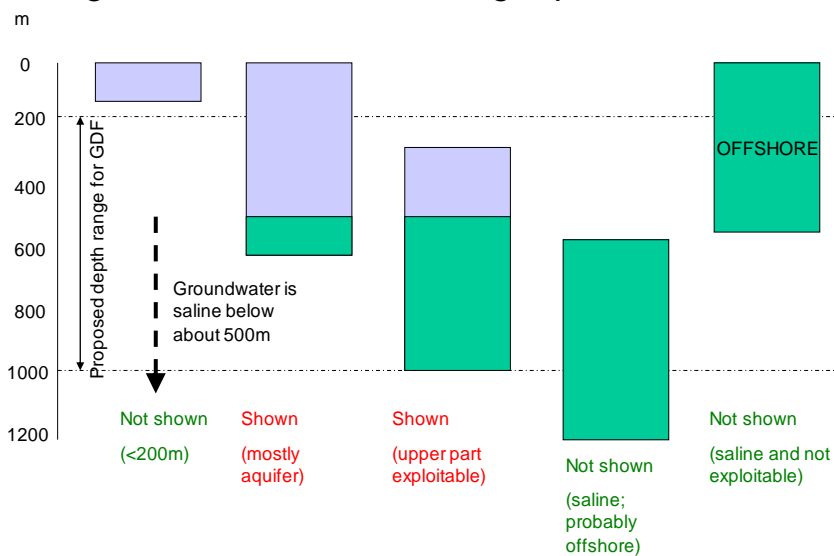
Insights of the CPG's deliberations

- Natural resources: primarily based on future intrusion risk, also resource value
- Groundwater resources: what is exploitable, how is an aquifer delineated?
- Distinction between excluding 'areas' (intrusion risk) and 'rock volumes' (aquifers)
- Achieving balance between prescription and scope for expert judgement, in absence of data
- Emphasising that assessments of 'suitability' and 'good host rock formations' are future tasks and not in scope of CPG

Results from screening by BGS

- 'To rule out areas that definitely could not host a facility for obvious geological reasons';
- Areas that are excluded are identified, i.e. where rock column over all of 200-1000m depth range is excluded according to criteria;
- Aquifers are not delineated as 3-D volumes, so are indicated as areas in which exploitable groundwater resources at so-far unspecified depth range (likely to be <500m) need to be considered in later stages;
- Permeable rock formations at >500m depth are likely to be saline and are not excluded.

Illustrations of where 'aquifer' is marked in Figure 13 in BGS screening report



Comments on Partnership's criterion 2b

Are sufficient areas remaining to make further progress worthwhile?

- The presence of exploitable groundwater resources ('aquifers', likely to be <500m depth) does not exclude an area at this stage;
- Permeable formations deeper than 500m are likely to be saline and thus not exploitable aquifers;
- Formations identified as aquifers are likely to have heterogeneous hydrogeological properties so their lateral and vertical extents are generalisations;

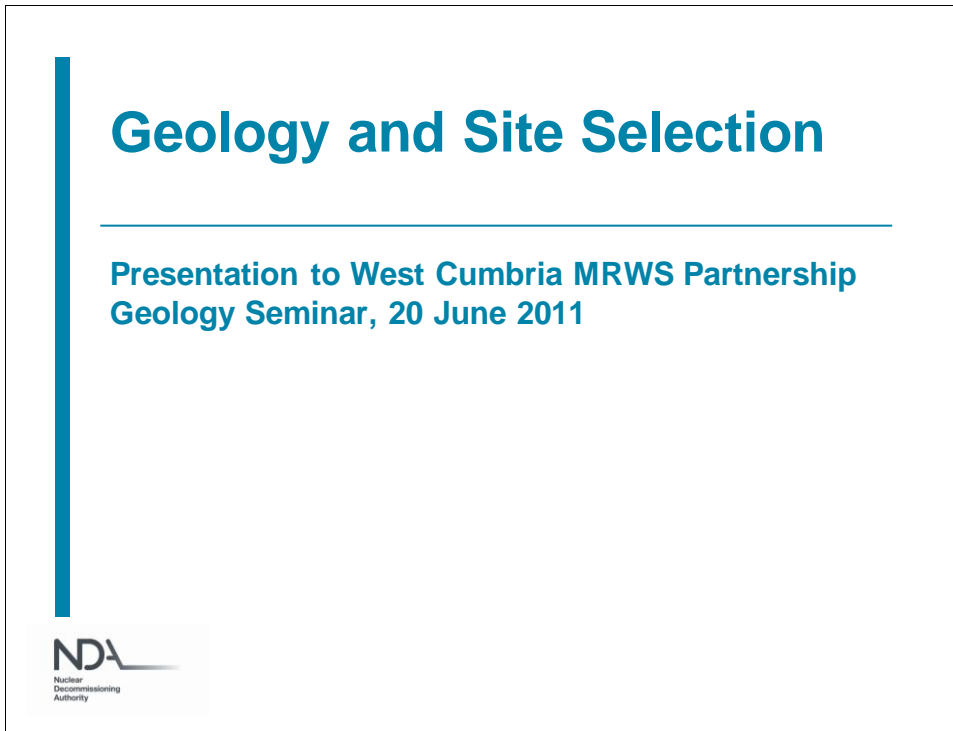
Compare typical areal scale of a GDF site ('footprint') versus the remaining area

Is there a suitable geological setting? - One of six objectives in MRWS Stage 4

Proposed evaluation criteria for geology are:

- The size of the potentially suitable volume of rock;
- The level of technical challenges from construction and engineering conditions, and availability of knowledge and technology by which they can be overcome;
- The level of difficulty to ultimately characterise the site;
- The robustness of the eventual safety case, based on likely geological and hydrogeological characteristics.

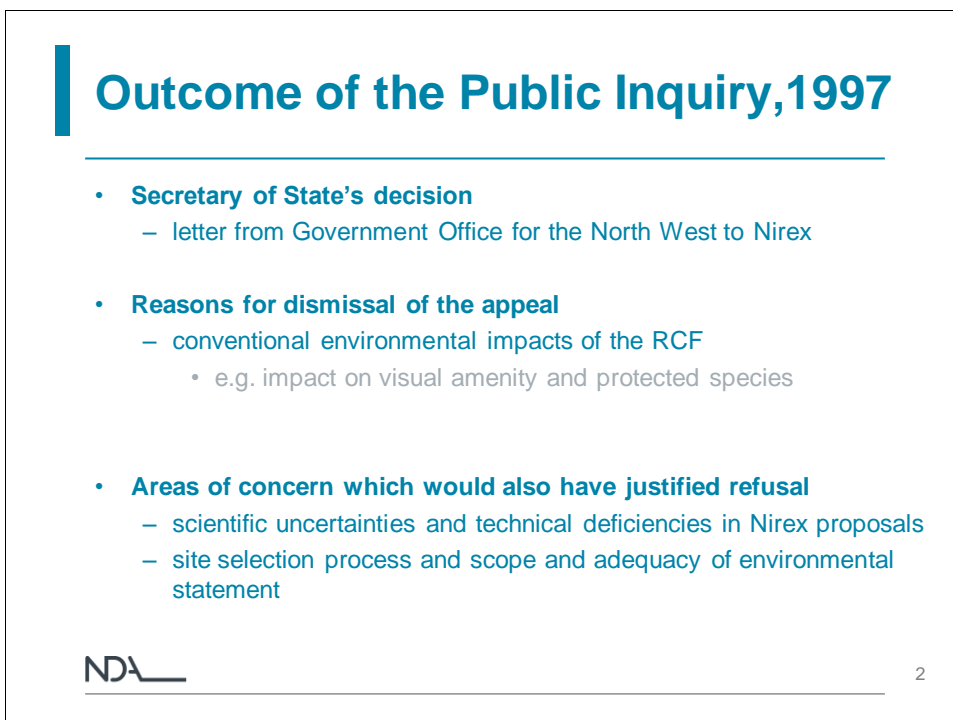
3. Dr Cherry Tweed, NDA presentation – slides



Geology and Site Selection

**Presentation to West Cumbria MRWS Partnership
Geology Seminar, 20 June 2011**

NDA
Nuclear
Decommissioning
Authority



Outcome of the Public Inquiry, 1997

- **Secretary of State's decision**
 - letter from Government Office for the North West to Nirex
- **Reasons for dismissal of the appeal**
 - conventional environmental impacts of the RCF
 - e.g. impact on visual amenity and protected species
- **Areas of concern which would also have justified refusal**
 - scientific uncertainties and technical deficiencies in Nirex proposals
 - site selection process and scope and adequacy of environmental statement

NDA 2

What is different now?

- **New process for site selection and GDF implementation**
 - voluntarism and partnership
- **Wastes for disposal are different**
 - previous process was just for intermediate level waste
- **Advances in disposal facility technology**
 - understanding of disposal concepts more advanced
- **Significant advances in underpinning science and technology**
 - including requirements and techniques for site characterisation

NDA

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How geology will be taken into account

- **MRWS Stages 1-3**
 - initial sub-surface screening
- **MRWS Stage 4 – desk-based studies**
 - geological setting considered in identification and assessment of potential candidate sites
- **MRWS Stage 5- surface-based investigations**
 - site-specific investigations used to gather information to develop designs and safety cases for regulatory scrutiny
- **MRWS Stage 6**
 - additional geological understanding used to confirm site's suitability

NDA

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Why is more information needed?

For that part of west Cumbria, not excluded:

- **Amount and level of geological information currently available is highly variable**
- **For most of region, insufficient geological information is available to make an informed decision on suitability to host a GDF at this point in time**
- **Even areas for which considerable geological information is already available would be evaluated further if they move forward in the process**

NDA

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Reasons for continuing

- **New process**
 - technical understanding and community support progress together
- **Compliance with international and national requirements**
 - DSSC suggests this may be possible in West Cumbria
- **Significant advances in measurement and interpretation of geological data**
 - allows more confidence in interpretation of geological information
- **International precedent**
 - geological disposal is being implemented overseas countries
- **NDA will only be able to implement if they can show the regulators the site is safe**
 - we would not want to proceed unless it was safe
 - success is not guaranteed

NDA

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4. Dr Jeremy Dearlove presentation – slides

**MRWS West Cumbrian Partnership
Criterion 2b
Geological Seminar**

Dr Jeremy Dearlove BSc (Hons), MSc, PhD
FGS, CGeol
Principal Consultant



KEY QUESTION

Criterion 2b
Following the geological screening report published by the BGS:

**“Do sufficient areas of West Cumbria
remain to make further participation
in the process worthwhile”?**



POSSIBLE ANSWERS?

LEGAL DISCLAIMER: I am not presenting any arguments **ON BEHALF** of Professor Smythe tonight, I am presenting what I understand to be the key issues he raised in his published document of 12th April 2011. I **DO NOT** accept any legal responsibility for Professor Smythe's published comments, or wish to have them attributed as my own

PROFESSOR SMYTHE ARGUES:

- In effect, **ALL** of "West Cumbria" is ruled out for further consideration – position *inferred* from the evidence considered at the Nirex Planning Inquiry



POSSIBLE ANSWERS?

- Historical versus Current site selection criteria
- Unsuitability of former Nirex Longlands Farm site
- Hydraulic gradient and likely complexity of alternative sites
- Alternatives: to the Longlands Farm site:
 - East Anglia
 - Areas outside those excluded by BGS report (including Eskdale and Solway Coastal Plain)

Therefore, the answer appears to be **NO?**



POSSIBLE ANSWERS?

CoRWM ARGUES:

- “There is presently no credible scientific case to support the contention that *ALL* of West Cumbria is geologically unsuitable”
- “Over much of the Partnership area, there is insufficient geological information to make an informed decision on whether any sub-area is suitable or not.”



POSSIBLE ANSWERS?

NDA ARGUES

- “there are a number of generic rock types present in the West Cumbria area which have generic geological characteristics consistent with the guidelines at depths suitable for the location of a geological disposal facility”.
- “Potential sites identified through the voluntarism process may be comparatively complex and hence need more time, effort and cost to characterise in order to demonstrate their suitability for safe geological disposal. Although characterising and demonstrating safety is more challenging for a comparatively complex site than for a simpler site this does not prevent complex sites from being considered”.



POSSIBLE ANSWERS?

Mr Chris McDonald (NIREX Planning Inquiry Inspector) comments that:

- “the whole of West Cumbria was not ruled out as geologically unsuitable at the time of the Nirex Inquiry.. On the other hand, we are aware of the view of Professor Smythe and others that complete unsuitability can be *inferred* from the evidence reviewed by the Inquiry, despite further evidence published after the Inquiry (notably “NIREX 97”). We do consider that there is some force in several aspects of that point of view, which are worthy of debate with the NDA, the BGS and others. “

Therefore, the answer appears to be **YES**



POSSIBLE ANSWERS?

- There is an apparent fear in West Cumbria that the NDA may ONLY consider the former Longlands Farm site at Stage 4. If only one site is available, then I agree with Prof Smythe that there are INSUFFICIENT areas in West Cumbria to make further participation worthwhile. If there are a number of potential sites, then further participation is worthwhile.
- NDA and CoRWM statements
- Site Selection Criteria

CONCLUSION

Providing it can be demonstrated that there are a number of potential sites to be investigated at Stage 4, and suitable site selection criteria are established, there appears to be sufficient areas in the MRWS West Cumbria Partnership area to make further participation worthwhile



5. Notes on discussions at the meeting

Questions and discussion after the speakers covered several areas below:

Water/hydraulic gradient

Several questions expressed concerns about the presence of water, both generally in the underground environment and specifically in relation to aquifers and e.g. warm springs in the Caldbeck Fells. A concern was also raised that further investigations themselves may compromise safety of the facility once constructed e.g. bore holes. In response, the panel reiterated geological disposal as the internationally preferred solution and indicated that there

is water present to varying degrees in all underground environments. Geologically speaking, water was said to be a part of a controlled environment where flow can be predicted and understood via ground water modelling systems. It was noted that computer models have to be calibrated with real situations. There was also confirmation that the movement of water, saline or otherwise, would be an important factor in any site specific studies that might take place at a later date.

The proximity of the mountains to the sea in West Cumbria was raised as a concern in terms of creating a high hydraulic gradient which could be a risky environment for a GDF, and the questioner indicated doubts about compliance with international agreements in relation to discharge into the sea. In response it was stated that a high hydraulic gradient is not necessarily present in *all* areas of West Cumbria and that in some areas the rate of water flow would be extremely slow and could potentially be consistent with the conditions needed for a safety case to be made for a GDF.

Monitoring and retrievability

A participant commented that 'most of us reluctantly accept that we need to do something with the waste' and went on to highlight the importance of including mining expertise amongst those investigating possible sites, as well as asking the possibility of retrievability of waste after placement in an underground facility. In response CoRWM highlighted that the monitoring of deep geological disposal post-closure is being considered as a subject for research by the European MoDERN programme which is being assessed for information useful to the West Cumbrian context. NDA stated that the MRWS White Paper makes it clear that a decision on retrievability should be made further down the line in conjunction with the local community. There are arguments for and against retrievability which will need to be weighed up at a later stage in the process.

Rock type

The NDA was asked if they knew what type of rock would be suitable for a GDF to which they replied that in general terms there are three main categories of suitable rocks: hard fractured rocks, thick sediment or salt-based evaporite rocks. However, in potential host areas there would be a long programme of work undertaken to understand the rock characteristics at a particular site. This would come later in the MRWS process if West Cumbria wanted to proceed. DECC reiterated that the BGS work done so far has been looking at high level exclusionary criteria, and that demonstrating the suitability of a specific area requires a detailed investigation framed by regulatory safety criteria.

One questioner was worried that lessons from Nirex hadn't been learned in terms of listening to different viewpoints about what the best solution would be. This related to a suggestion that Black Combe would present a solution where waste could go 'in [horizontally] rather than down'. There were two responses, one from CoRWM highlighting the work and deliberation which had led to deep geological disposal being decided on as the best route for waste, and the fact that it does allow for a variety of design concepts. Secondly it was pointed out that Black Combe is not in an area ruled out by the initial BGS screening so there is still a possibility of studying the area more closely.

There was also a question and some discussion about the permeability of different rock types after which it was re-iterated that much uncertainty was bound to remain at this stage, but further detailed investigations would reveal more at a later stage if there is a decision to proceed further.

National Park

There was a query about what land area is left under consideration if the areas excluded by the initial BGS screening *and* the area which is National Park are both ruled out. A response was estimated at the meeting but clarification from the British Geological Survey afterwards stated the figures to be 21.6% of onshore Copeland and 28.1% of onshore Allerdale.

In response to a question about the involvement of the Lake District National Park Authority (LDNPA) it was confirmed that LDNPA does have a seat as a full member of the West Cumbria MRWS Partnership.

Site selection process

Concerns were expressed about the potential site selection process in the future given the absence of clear criteria against which to evaluate a potential site. Another concern expressed related to West Cumbria being the *only* area to have expressed an interest in entering the MRWS process; government were accused of not trying hard enough to encourage other areas to volunteer to take part in the process. DECC informed the meeting that the invitation to other areas to express an interest in taking part in potentially searching for a GDF is still open and that they are still encouraging other areas to come forward. In addition DECC are planning to undertake a consultation imminently about the site identification and selection process and those criteria that could be applied anywhere in the UK – the consultation is not specific to West Cumbria. However people in West Cumbria and the Partnership themselves will be welcome to scrutinise the proposals and offer comments during the consultation process.

General MRWS process

The transparency of the West Cumbria MRWS Process was questioned in relation to the mention of meetings which took place prior to the Partnership's formation and referred to the 'trump card' of a 'willing public' in West Cumbria towards a GDF and new nuclear power stations.

A concern was expressed that some members of the public felt they had 'been volunteered' to take part in the search for a potential GDF site and that their views are not necessarily being represented as they might hope. Cllr Elaine Woodburn spoke as Chair of the Partnership to clarify that the Partnership had yet to make a decision about whether they wanted to continue with the process to search for a site and reiterated the commitment of the Partnership to be open and transparent. She referred to the Partnership meetings being held in public and the funds that are being spent on trying to involve the public in the consultation. She emphasised that the process will only continue if the community i.e. West Cumbrian public wishes it to.

Another speaker said that although they were aware that there would not be a 'go ahead' without the approval of regulatory bodies (e.g. Environment Agency) which are governed by law, there was a concern that laws could be changed to accommodate the development of a GDF. This was raised alongside the point that LDNPA and Cumbria County Council opposed the NIREX project at Longlands Farm but were now involved in the MRWS process. In response it was re-stated that the current stage of the MRWS process is not a commitment to host a facility and that a community right of withdrawal would exist right up until the start of construction at a much later stage after much more detailed investigations had been carried out.

A further question was asked about how the Partnership would involve the public in the consultation and make sure information gets through 'to ordinary people in the street'. A Partnership member explained the next stage of the public and stakeholder engagement work being undertaken which would include the publication of a consultation document in the autumn, alongside a series of public events and other initiatives e.g. aimed at young people and would also include an opinion poll survey carried out to recognised guidelines and standards.

Finally there was a question to ask what would happen if the West Cumbrian public say no to the idea of a GDF in their area, expressed together with a concern that due to there being only one option there was pressure on Government to 'try and make it fit'. DECC responded by saying that if a community says no, the process will end but that the UK will still be left with legacy waste that needs dealing with.

Geological Debate

The Partnership was asked why it did not allow David Smythe a 45 minute debate as he requested. The Partnership's Programme Manager explained that the role of the Partnership is to ensure that the range of views are explored and heard on a topic that is complex, not to emphasise one view over another. The Partnership put together a range of speakers together for tonight's seminar including the NDA (who would be the repository developer), CoRWM (the independent committee scrutinising the process), the Partnership's independent peer reviewer, and an additional independent hydrogeologist to pass comment in the area. David Smythe was invited to speak alongside these speakers to set out his views in his 35page paper. As with all presentations to the Partnership, 15 minutes was allowed to cover the key points, backed up by detailed papers where required. It was acknowledged that it was a shame he did not feel able to take up the invitation.