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| Title: | Preliminary Assessment Report – Geology (Criterion 2) |
| Author: | Technical Review Group |
| Notes: | Published 4 July 2011. This report was discussed at the 23 rd June Partnership Meeting – see the meeting report (Document 198, Section 4) for details of the discussions and conclusions. |

1. Introduction

- 1.1 This report has been prepared by the Technical Review Group (TRG) to inform the Partnership's assessment of progress towards being able to make a judgement against Criterion 2 in the work programme.

2. Criterion

- 2.1 Under the Geology criterion there are two criteria:

2a Whether the Partnership is confident in the integrity of the BGS screening work/report

2b [Whether there are] sufficient areas remaining in West Cumbria after initial screening to make further progress worthwhile

3. What we are looking for (as stated in the Work Programme)

- (i) Acceptable peer review process
- (ii) Broad stakeholder confidence in BGS study
- (iii) Subjective judgement that the results of the screening leave enough 'possibly suitable' land to make further progress worthwhile

4. Work Completed

- 4.1 The main work undertaken by the Partnership under this criterion has been:

- the commissioning by DECC, at the request of the Partnership, of a report from the BGS to identify those areas of West Cumbria that are clearly unsuitable for a GDF (Document 116)
- the peer review of the BGS report by two independent reviewers (Documents 111 and 113)
- providing the opportunity for the public and other stakeholders to read and comment on the BGS report and the reports of the peer reviewers (PSE 2 report, document 157)
- discussion within the Steering Group about the on-going concerns expressed by members of the public and expert stakeholders (PSE 1 and 2) about the suitability of West Cumbria for a GDF in view of the rejection of Nirex's proposals in the 1990s

- holding a Geology Seminar for Partnership members and other stakeholders to learn more about the geological screening and relevant geological developments since the 1990s (Document 123)
- the preparation of a report by the NDA on relevant geological developments since the 1990s (Document 143)
- a request to NDA to prepare an expanded and fully referenced report of geological developments since the 1990s and why it believes the prospects of finding a site for a GDF in West Cumbria are sufficiently good to justify proceeding further (Document 167). This NDA briefing was subject to commentary by Dr Jeremy Dearlove, the Partnership's independent advisor on geology (Document 194)
- a request to NDA to clarify their current thinking about the possible distance between the underground and surface facilities (Document 169)
- a second geology seminar on 20 June 2011 to explore further the potential suitability of West Cumbria's geology for a GDF

5. Commentary

5.1 With respect to Criterion 2a and 3(i) and (ii) above ('What we are looking for'), the BGS screening study has been completed. The Partnership commissioned two independent peer reviews of the study. These were conducted by Dr Jeremy Dearlove (FWS Consultants) and Prof Agust Gudmundsson (Royal Holloway College, University of London). Following several rounds of comments and amendments by the BGS, both peer reviewers published a statement saying that the Partnership can rely on the study as a preliminary screening report against the criteria set out in the White Paper (Docs 111 and 113). This is consistent with wider stakeholder and public input received during PSE2, where the results were widely publicised. However it is worth noting that both peer reviewers as well as some stakeholders pointed out the limited nature of the screening study and the omission or narrow interpretation of certain geological criteria. Such criteria would need to be subject to further rigorous assessment later on if a decision to proceed into Stage 4 is taken.

5.2 The BGS survey screened out areas clearly unsuitable for the underground facility, but was not required to consider the suitability of locations for the surface facility. The NDA has indicated that the underground and surface facilities could be separated by a distance of up to 10km (possibly further). A distance of 10 km would mean that much of the area excluded for the underground facility by the BGS study could still be available for the surface facility. This has implications for the Siting Process which are discussed in a further Preliminary Assessment Report to the Partnership (Document 186).

5.3 Turning to criterion 2b and 3 (iii) above ('What we are looking for') and the question of 'sufficient areas' and 'possibly suitable' land remaining after the BGS study. When the criterion was originally drafted 'sufficiency' was thought of in quantitative terms – whether the remaining area was sufficient in size. However, in view of questions raised by members of the public and expert stakeholders about the characteristics of West Cumbria's geology (PSE 1 and 2), the Partnership felt it was important to give some consideration to the suitability of the remaining area.

5.4 In quantitative terms, out of the 2,536 km² studied by the BGS some 646 km² (25.5%) was excluded as clearly unsuitable. This leaves 1,890 km² (74.5%) available for further investigation. (Document 192). The BGS report also indicated that, additionally, a volume of rock would need to be excluded because of aquifer classification. The NDA has indicated (Document 192) that it is not possible to provide an estimate of this volume at this stage in the MRWS process. The area available for future investigation (1,890 km²) can be compared to the anticipated 'footprint' of a GDF which could range from 5.6km² to 23.3 km² depending on inventory and type of host rock (Doc 88, table 2, Inventory Presentation from NDA)).

5.5 In terms of the suitability of the land available for investigation in West Cumbria, the main issues the public and stakeholders have raised are:

- The geology of West Cumbria has already been found unsuitable for a GDF by the Nirex Planning Inquiry. (Document 157, section 7, PSE 2 report)
- West Cumbria is a region of high hydraulic gradients, very short groundwater pathways and complex geology that is not readily predictable and as such is incompatible with international guidelines¹ (for example, Document h, p.1, David Smythe, February 2011; Document 150, p.19, Partnership meeting report, Stuart Haszeldine)

5.6 Many members of the public and a few individuals from the professional geological community expressed these concerns.

5.7 In response to these concerns the Committee on Radioactive Waste Management (CORWM) wrote to the Partnership (Document 162) and stated, "Our position is that there is presently no credible scientific case to support the contention that all of West Cumbria is geologically unsuitable". CORWM goes on to say that in their view the Nirex Inquiry Inspector did not draw conclusions about the suitability of West Cumbria *as a whole*. This view is confirmed in the note of the meeting between the NDA and the Nirex Inquiry Inspector held on 12 March 2011 (Document 193).

5.8 The Partnership also asked Dr Jeremy Dearlove to review the arguments presented by Professor David Smythe in response to the statement from CoRWM (Document j, David Smythe, April 2011; Document 175, FWS Consultants Ltd, May 2011). Dr Dearlove said: 'Our current understanding of the geology associated with the former Longlands Farm site indicates that it is indeed complex (structurally, lithologically, geochemically and hydrogeologically). However, it is a considerable leap to go from this position to then suggest that the geological complexity of the 'coastal strip of West Cumbria' is already sufficiently well understood to allow us to draw the conclusion that it should be rejected as being potentially unsuitable for a repository site'

¹ IAEA guidelines in Report 111 G4 1994 state, inter alia, "Uniform rock formations in comparatively simple geological settings are preferred because they are likely to be more easily characterised and their properties more predictable".

5.9 In a further response to the concerns raised, the Partnership requested the NDA to provide a more detailed briefing to clarify why it believes the prospects of finding a site for a GDF in West Cumbria are sufficiently good to justify proceeding further, including a commentary on the consistency of West Cumbrian geology with international guidelines (Document 167). These requests were made with a view to obtaining information that would indicate in a positive way that there is 'possibly suitable' land in West Cumbria (see 3 iii above) and thereby give greater confidence to judgements about whether criterion 2b has been satisfied.

5.10 In the TRG's view the briefing provided by the NDA does not fully meet its request although it does provide helpful information about the NDA's approach and perspective. In particular the TRG has noted that NDA disagrees to with the view (see 5.5 above) that the general character of West Cumbria's geology is at variance to the preferred geological setting described in international guidance; instead taking the view "... that there are a number of rock types present in the West Cumbria area which have the generic geological characteristics consistent with the guidelines at depths suitable for the location of a geological disposal facility." (Document 167, paragraph 3.11). This has created an impression in the TRG that the NDA may not be acknowledging the scale of the challenge presented by West Cumbria's geology.

5.11 In addition the TRG has noted that, in response to the request for information about the prospects of finding a suitable site, the NDA has responded in only general terms drawing on its work on the generic Environmental Safety Case where a range of hydrogeological conditions were assessed. The NDA briefing states (paragraph 5.2) "The range of conditions included the type of hydrogeological setting represented in West Cumbria; these conditions were found to have the potential to support the development of a safety case for a suitably designed and located disposal facility based on existing disposal concepts". Although helpful as far as it goes, the NDA is unable at this early stage to provide a range of positive geological indicators that would have given added confidence in the possible suitability of West Cumbria's geology.

5.12 So, in assessing Criterion 2b and 3(iii) above ('What we are looking for') and the question of 'sufficient areas' and 'possibly suitable' land, the Partnership has received representations that the geology of West Cumbria is unsuitable for a GDF, a further briefing from the NDA, including its views about the prospects of finding a suitable site, CORWM's view that there is insufficient credible evidence to demonstrate unsuitability across the whole of West Cumbria and similar views expressed by the Partnership's independent advisor on geology.

5.13 The TRG view is that the argument that all of West Cumbria should be excluded on grounds of unsuitability does not appear to be widely accepted by the scientific community. Accepting that argument would require detailed geological evidence from all parts of the area to demonstrate that there is no prospect of finding a suitable area of host rock. This level of evidence is not available, although the TRG recognises that some people believe it can be inferred from the information already in the public domain. Although more evidence of positive geological indicators would have enhanced confidence in the

prospects of finding a suitable site, the absence of detailed geological evidence clearly ruling out all parts of West Cumbria has led the TRG to conclude that the land available for investigation after the BGS study should be viewed, at the present stage, as having some prospect of providing a suitable site.

5.14 What needs to be said in addition, however, is that from contact with a wide range of stakeholders on this topic there appears to be a general awareness that, if the process proceeds, there is a risk that the geological conditions of West Cumbria *may* not provide a suitable site for a GDF that meets regulatory requirements - albeit with a divergence of view about the scale of that risk. This is a risk that needs to be recognised.

6. Conclusions

6.1 It seems fairly clear that in terms of criterion 2a the Partnership can be confident in the integrity of the BGS screening report. The report has been endorsed by two independent reviewers and has not been subject to significant criticism from elsewhere.

In terms of criterion 2b the Partnership can reasonably conclude that the 1,890 km² of land not ruled out as clearly unsuitable by the BGS provides a sufficient amount of land, in terms of area, available for investigation.

However, the suitability of that area for a GDF has been challenged. Although it would have been more convincing if more positive indicators of suitability were available, the absence of clear, detailed evidence that demonstrates that all of West Cumbria should be ruled out leads to the conclusion that there is enough 'possibly suitable' land to make further progress worthwhile.

So, although Criterion 2b can reasonably be viewed as having been satisfied, there is a risk that the geological conditions of West Cumbria *may* not provide a suitable site for a GDF that meets regulatory requirements. This should be fully recognised and described appropriately in the Partnership's Final Report.

ANNEX

PSE1 and 2 – Issues relating to geology

PSE 1

Extract from Document 61, paragraph 3.4.2

Issues:

- a) It is evident from the engagement that many people already believe that the geology of West Cumbria is not suitable for a GDF. Reasons quoted for this belief include personal experience of the land and that the Nirex study in the 1990s already showed the geology to be unsuitable.

Partnership Response: Investigations by Nirex in the 1990s focused on a relatively small area of West Cumbria which had been identified through a site selection process restricted principally to sites that were owned by central Government or by its nuclear industry shareholders. Therefore the geology of the whole of West Cumbria has never been systematically assessed with regard to its suitability for a GDF. Stage 2 of the MRWS site selection process involves an initial screening of the whole of West Cumbria by the BGS to rule out areas which are clearly unsuitable for geological reasons.

In response to these issues we will:

- i. Include in the PSE2 information, an explanation of how the BGS study is different to the previously carried out Nirex geological work. (PSE Sub-Group)
- ii. Include a page on the website explaining the BGS study, including: aim, geographic scope, criteria, outputs, and how it is different to previous geological work such as that carried out by Nirex. (Communications Adviser, Osprey)
- iii. Produce a statement on what the Nirex process in the 1990s showed about the potential suitability of parts of West Cumbrian geology, if possible including an authoritative statement from an independent organisation. (Communications Adviser, Osprey)

PSE 2

Extract from Document 157, section 7

| Ref. | ISSUE | WHO | RESPONSE |
|--|---|-------------------------------|--|
| Building Understanding of MRWS, including the BGS study | | | |
| 7.1 | Some people realised as a result of the engagement process that the BGS study only ruled out areas for the underground site not the surface site, and that it would therefore make more sense to talk about 'sites' rather than 'a site'. This not only could have significant implications for the siting process and community involvement, but also suggests more work needs to be done to clarify this specific point in relation to the BGS study. | Communications Advisor | <p>In preparing communications and engagement materials between now and the end of PSE3 design we will consider how we can make it clearer that the repository and surface facilities are likely to be in different places.</p> <p>Government consultation on Stage 4 is likely to define a 'potential candidate site' as a combination of a surface site for the surface facilities and a volume of host rock for the underground facility.²</p> |
| 7.2 | The Nirex Inquiry is still a significant issue for many people. For example, there is still uncertainty over how this MRWS process is different to the previous Nirex process. There are also repeated assertions that Nirex has already ruled out West Cumbria as being suitable for a repository. | Communications Advisor | <p>The Partnership is continuing to press the Nuclear Decommissioning Authority to produce and effectively communicate a response to questions about the implications of the Nirex Enquiry for the MRWS process. We are also asking for comment from a number of individuals and organisations, including holding a second seminar on geology in June. It is important that Partnership members and the public have enough information to reach an informed conclusion about whether there is potentially sufficient suitable geology in West Cumbria.</p> |

² To be confirmed once the consultation document becomes available.