Consultation Response, Providing Information on Geology.

Phil Davies,

Individual Response:

(Please note, written late and in haste, still essentially in draft)

1.To what extent do you think our proposed approach to providing national-scale existing information about geology relevant to long-term safety is appropriate? Please give your reasons.

It is only appropriate if, having made a "generic safety case" for your three "typical host-rocks", you then do not shrink from drawing conclusions about the merits or demerits of each "type". This is something that neither DECC nor RWM is prepared to do, for political reasons (ie no-one might volunteer). So we are left with the "DECC dogma" that all sites are equal and none is any better or worse than any other, which is highly unlikely to be true in fact. Internationally accepted criteria have always held that the most favourable conditions for disposal are simple geology and long travel times for water to return to the surface. This implies at least that ***geological complexity*** is to be avoided per se. Why don't you then say so? What is the point of geological knowledge if, having gone to the trouble of getting it, you don't then put it to use?

2.To what extent do you think that the proposed national information sources are appropriate and sufficient for this exercise? Please give your reasons.

I am not familiar with them so cannot comment per se. I would however want to know the effect of heat dissipation on various host-rock environments, since Nirex' remit only covered ILW. I don't see much or anything about heat in this document, particularly in relation to high-burnup spent nuclear fuel. Some more detail is required, and maybe more transparency.

I am not sufficiently persuaded yet that mined geological disposal is preferable to deep borehole disposal, as CoRWM once recommended as a watching brief, for reasons of safety, less environmental degradation, greater security, greater intergenerational equity, and possibly less cost. So it may not be necessary to build a GDF at all.

3. To what extent do you agree or disagree with the proposed form of the outputs from geological screening?
What additional outputs would you find useful?

There are normally considered to be three "pathways" back to the surface, water, gas, and human intrusion. Your table 3 contains no information whatsoever about the gas pathway. The regulators have said this will have to be left to the site-specific stage. This is highly suspect, as scientific method insists that "one must not verify an idea using the same data that suggested the idea in the first place". (Reference from preface to Richard Feynman: Six Easy Pieces, p.xix).

There is nothing about the effect of microbes.

You should examine your attribute list to see if any prioritisation is appropriate. With regard to prioritisation, which takes priority, host rock, rock structure, or hydrogeology? At the time of the Nirex Inquiry it was groundwater (hydrogeology), following Chapman, McEwen and Beale (1986) and Nirex "The Way Forward"(1987). The proposed geological environments were all hydrogeological. What was most important was *regional* hydrogeology, not host-rocks per se. This has been lost. Now the environments are defined by host rock alone, in the most simplistic way possible (HSR, LSSR, ER). Nevertheless, the international criteria (IAEA) still hold that simple geology, absence of faults or fractures, together with long groundwater return times, offer the most suitable siting potential. It is true that you acknowledge the role of "rock structure" but you fail to acknowledge publically the possible difficulties you will have in mapping fracture networks in real life. It is likely that you will either not be able to drill sufficient boreholes to adequately characterise the fracture network, or else you will need to drill so many that you will ruin the site in the process.

In A2.6 you say you have chosen (two) attributes to provide information on rock type, namely distribution of "suitable" host rock types (HSR, LSSR, ER), and properties of surrounding rocks. Is this description not woefully inadequate, and does not the use of "suitable' make the classification essentially vacuous?

4. Do you have any other views on the matters presented in the draft Guidance?

Yes, under question 2, the issue of a site for newbuild spent-fuel disposal is, wrongly, tacked on as an after-thought (2.3). Yet this is the underlying raison d'etre for the whole enterprise, since without it the Regulators would have no option but to close the door on the whole newbuild process, and as it is, their independence, and our safety, is being potentially compromised, by being urged by Government to "hurry up", even though they are apparently short of staff. Its political priority is therefore much higher than that of the rest of the inventory, even though it does not, and need not otherwise, exist. You should be more transparent.

Yes, re Finland and Sweden "go aheads" on GDFs (relevant issue arising in RWM news update): regarding the regulators' go ahead, at the recent IGD-TP conference hosted by RWM, the outcome of an international workshop on "Bentonite Homogenisation" was the proposal for a large project called "Homo Bento". The Rationale for it is given below verbatim – the potential inhomogeneity of bentonite buffers is "pertinent for safety assessment", yet up till now the opposite (ie that they are homogeneous) has been assumed. Does the go-ahead for the Finnish and Swedish GDFs (which rely on bentonite buffers) imply that this research is now surplus to requirements, or is the opposite the case, namely that the need for this research implies that the go-ahead for Finland and Sweden GDFs is premature?

EXCERPT from IGD-TP No6 Report, 2015: "Outcomes" from Working Group 2 on "Bentonite Homogenisation":

Rationales: Safety assessments assumes a homogeneous bentonite material density distribution with a minimum dry density of 1.45 gcm-3 at full saturation. This may be an optimistic approach that needs to be verified.

To fulfill this requirement, it is assumed that:

1.Initial material property differences vanish through resaturation (e.g. blocks and pellets)

2.Backfill process induced heterogeneities vanish with resaturation (including technical gaps)

3.Heterogeneities induced through the nearfield evolution disappear with resaturation (including chemical interactions at all interfaces)

But based on experimental evidences homogeneity is never fully achieved, thus following questions become pertinent for safety assessment:

1. What phenomena and processes are expected in backfilled repository sections that could be detrimental to safety and that are caused by a heterogeneous backfill?

2. What degree of backfill/buffer homogeneity is needed to ensure long term safety?

3. If heterogeneities are detrimental to the long term safety, how can these be limited or avoided?