

JAN 22 1990

NOTE TO: R. Ballard

FROM: J. Pohle 

SUBJECT: REVIEW OF CNWRA REPORT "IDENTIFICATION AND EVALUATION OF REGULATORY AND INSTITUTIONAL UNCERTAINTIES IN 10 CFR PART 60" (41117; L61701)

I have been assigned to review selected regulatory and institutional uncertainties contained in the subject report. My comments on each of those uncertainties are provided below. John Bradury provided comments on the uncertainty related to sorption (RR2009; UN0018). Having only two days to review the report and prepare written comments, these comments have not been thoughtfully considered by other staff within the Hydrologic Transport Section.

Specific Comments

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RR2000 UN0001 B-50 Fastest path of likely radionuclide travel

The "uncertainty" described in the report is whether the fastest path of likely radionuclide travel can be delineated with reasonable assurance in heterogeneous geologic materials present at real repository sites. Thus, it is deemed "uncertain" as to whether 60.113 (a)(2) is implementable. No uncertainty in the meaning of "fastest path of likely radionuclide travel" is claimed or presented in the report and yet the apparent recommended action is for the NRC staff to "better define the meaning of 'fastest path of likely radionuclide travel'".

If it is not technically feasible to identify the fastest path of likely radionuclide travel given the current state of the art in hydrogeology (where the fastest means literally the fastest and not some average over some cross-sectional area that cannot be defined generically), a semantic exercise to redefine existing terms will not successfully solve the problem of technical feasibility. Regulations that are not implementable should be withdrawn.

I noted the comment of either OGC or other DHLWM staff, provided with the subject report, that "since the requirement under consideration is for prewaste-emplacement which has no direct bearing on meeting the EPA standard .....". If it is the NRC's position that the performance objectives of 60.113 need to have a direct bearing on the repository meeting the EPA standard (i.e., isolation and containment) and the GWTT performance objective fails that criterion then it is "uncertain" as to how the DOE should demonstrate the "effectiveness of natural barriers, including barriers that may not be themselves a part of the geologic repository operations area, against the release of radioactive material to the environment" as required in 60.21 (c)(1)(ii)(D) (no uncertainty in this citation is presented in the subject report). What measure of the "effectiveness of natural barriers, etc." should DOE use in this demonstration? If not GWTT, then GWTT does indeed appear an unnecessary performance objective and should be replaced with a different concept altogether, preferably one with a direct bearing on the EPA standard.

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RR2000 UN0002 B-52 Disturbed zone

The report indicates that the meaning and subsequent application of the term "disturbed zone" is unclear due to ambiguity and circular logic. First, I see no ambiguity in the term. The rulemaking record as to what the term means and what must be considered in defining the boundary is quite clear. Second, to have what was thought at the time to be a simple measure of the goodness of the geologic setting to be used as a comparative criterion (siting criterion in the draft rule stage) in a site selection process (the logic used by the staff at the time but not put forth in the formal record) pre-waste-emplacement groundwater travel time was created as a concept. The "pre-waste-emplacement" aspect avoided the complications of having to consider repository-induced affects during the site comparison/selection process. When in the final rule the GWTT was included as a "post waste emplacement" performance objective, repository induced affects could no longer be completely ignored if GWTT was to be defended as having any bearing on a repository meeting any release standard. The direct consideration of those affects in the calculation of GWTT was avoided by the disturbed zone concept (the affects would still have to be estimated to define the boundary of the disturbed zone, as a separate analysis, and thus, would be considered indirectly). While I do not necessarily see this as circular logic, I believe the approach was a "quick fix" to defend what may be an indefensible performance objective (in the context of the EPA standard). What was hoped to be avoided originally could not be when a site comparison criterion was made a post-closure performance requirement. One could also argue that if GWTT is a meaningful measure of the post-closure waste isolation capability of the geologic setting, consistency demands that all anticipated processes and events (as well as any potentially adverse conditions found to be present at a site) should be considered in the analysis (both natural and repository induced, if apes can be categorized in that manner).

The problematic area in the rule is with GWTT. If an alternative performance objective is developed to replace GWTT (assuming a substitution is required concomittant with deleting GWTT) the action to be taken on the disturbed zone would be deletion. Otherwise, I see no need for any action related to clarifying or redefining the term.

RR2000 UN0003 B-54 Anticipated processes and events

This primary regulatory text citation assumes that GWTT (regulatory requirement RR2000) is to be evaluated considering anticipated processes and events. The staff of HLGP has been thinking that to consider apes in evaluating GWTT would be logical and consistent if GWTT is to have any bearing on the repository meeting the EPA standard. However, informal discussions with staff of OGC indicate that their thinking is that apes are not required to be considered in evaluating GWTT (I hope I haven't overstated their "off-the cuff" thoughts). A definitive conclusion needs to be reached on this before cross-referencing uncertainty in apes to GWTT.

RR2000 UN0004 B-56 Unanticipated processes and events

Same as previous comment on RR2000 UN0003.

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RR2001 UN0002 B-61 Fastest path of likely radionuclide travel

See previous comment on RR2000 UN0001.

RR2002 UN0003 B-70 Adequately evaluated

I agree with the comments of either OGC or other DHLWM staff provided with the subject report. I have nothing further to add.

RR2002 UN0004 B-72 Not likely to underestimate its effect

I agree with the comments of either OGC or other DHLWM staff provided with the subject report. I have nothing further to add.

RR2002 UN0005 B-74 Adequately investigated

I agree with the comments of either OGC or other DHLWM staff provided with the subject report. I have nothing further to add.

RR2002 UN0012 B-75 Geologic Setting

I have no comments of this item.

RR2002 UN0014 B-76 Fastest path of likely radionuclide travel

Associating the uncertainty in "fastest path of likely radionuclide travel", identified previously in the context of the primary regulatory text citation GWTT [60.113(a)(2)], with the primary regulatory text citation on potentially adverse conditions [60.122 (a)(2)] assumes that the significance of potentially adverse conditions found at a site will have to be determined in the context of the GWTT performance objective. 60.122(a)(2) requires that, under certain conditions, the potentially adverse condition be shown not to affect significantly the ability of the geologic repository to meet the performance objectives relating to isolation of the waste. The CNWRA report assumes that GWTT is one of these performance objectives relating to isolation of the waste. However, this in itself is uncertain. Statements in the formal record are contradictory on this matter. This needs to be resolved. However, if it is found to be required to demonstrate that the presence of potentially adverse conditions does not significantly affect the ability of the geologic repository to meet GWTT, it would be inconsistent to ignore apes in the analysis of GWTT because both deal with future changes to the natural system. Further, it would reaffirm the criticism of the "pre-waste emplacement" GWTT concept and its utility.

RR2002 UN0015 B-78 Disturbed zone

Same as previous comment on RR2002 UN0014.

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RR2002 UN0017 B-80 Inconsistency in treatment of combinations of potentially adverse conditions

I see no inconsistency in this area. In 60.21(c)(1)(ii)(B) and 60.122(a)(2) the objective is to assess individually the significance of potentially adverse conditions present at a site (their presence alone causes a concern that the isolation capability of a site may be compromised) albeit in terms of site performance as the measure for judging a conditions "significance". That information is to be presented in the SAR. As a technical reviewer I need to know the sensitivity of the site's performance to individual conditions present. The objective of analyses undertaken with respect to 60.112 and 60.21(c)(1)(ii)(C) is different in that the objective is determining the bottom line performance of the repository with respect to the EPA standard. Whether this is done in one analysis where all conditions, processes and events are lumped or a series of analyses of individual conditions, processes and events with the results added together at the end is not a concern at the level of the rule although it is a technical concern with respect to the methodology employed (analyses of individual conditions, processes and events could ignore potential couplings or interrelationships between processes, etc.).

RR2004 UN0018 B-86 Regional groundwater flow system

Regulations are generic. Because the Commission "undoubtedly" intended for any regional groundwater flow system of concern to be defined as that which affects the repository in question. I do not see the "regulatory" or "institutional" uncertainty.

One could argue that it is a "technical" uncertainty with respect to the Yucca Mountain site if one had no knowledge of the area. However, because we have identified no concerns about the regional groundwater system defined in the Yucca Mountain SCP and DOE has not expressed any concerns over its meaning. I see no basis to provide technical guidance to DOE regarding this hypothetical uncertainty. Unless there is a technical basis to question the regional groundwater flow system defined by DOE as relevant to this site, this "uncertainty" should not be kept on "the books" because it is a non-issue at this time. If it becomes a concern in the future, it can be entered into the system then. Isn't that how the system is supposed to work?

RR2005 UN0018 B-88 Regional groundwater flow system

Same comment as on RR2004 UN0018.

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RR2009 UN0018 B-89 Sorption of radionuclides

To the best of our recollection, participants at the Geochemistry Workshop referred to in the report did feel that the term "sorption" of radionuclides in the potentially adverse conditions section of the rule was too constrained. It was identified at this meeting that the potentially adverse conditions listed in the siting criteria were inconsistent with corresponding favorable conditions. For example, precipitation of radionuclides is listed under favorable conditions but not under potentially adverse conditions. Consequently, the DOE could respond to the letter of the rule in determining only the conditions that would reduce sorption, and fail to characterize geochemical conditions that might increase transport of the radionuclides, a more inclusive measure of site suitability.

Although it appears that a more inclusive term in the regulation such as "transport of radionuclides" would serve a better purpose, I do not consider it correct to identify the term "sorption" of radionuclides as being a regulatory uncertainty as is done in this document. The definition of "sorption" is not uncertain. For example, the definition is found in the NRC TP on radionuclide sorption.

RR2019 UN0018 B-98 Evidence of

I agree with the comments of either OGC or other DHLWM staff provided with the subject report. I have nothing further to add.

RR2025 UN0018 B-100 Air-filled pore spaces

Perhaps the documentation accompanying the unsaturated-zone rulemaking will clarify the questions presented in the report. That information should be reviewed. The rationale for inclusion presented in the report contains a recommendation that seems to be an opinion of the author. I question whether the author is really uncertain as to the meaning of air-filled pore spaces or is raising the uncertainty as a vehicle to make a change in the rule to reflect that opinion. Why aren't recommendations also made on the difficult "uncertainties" elsewhere (i. e., GWTT)?

I'm sure the intent was to consider any natural (pre-existing) interconnected pore or fracture space, containing an interconnected non-liquid phase, between a repository site and the accessible environment as a potential release pathway. This assumes that radionuclides in a gas phase will exist or could be generated from the inventory placed in a repository exposed to such a pathway.

Why was the word air used? I suspect that no-one could envision an underground environment as geologically shallow as a repository as having significant quantities of gas other than air (a mixture of oxygen, nitrogen, and other gases that surrounds the earth and forms its atmosphere). The definition of air would allow other earth-derived gases to be considered, no matter how small in concentration.

Presumably, barrier system derived gases (whatever they are) would not exist prior to emplacement of waste, and thus are not a natural condition of the site. However, if barrier system derived gases are generated and complicate

the transport mechanism (processes), they should be considered in the transport calculations to determine the significance of the pre-existing condition of the site in the context of compromising the ability of the repository system (i.e., post-emplacement conditions) to meet the performance objectives related to isolation of the waste.

#### General Comments

1. The report is inconsistent in making recommendations. In some areas specific recommendations are made (Rationale for inclusion, page B-100) while in other areas only general recommendations are made (GWTT, page B-50). If the intent is to identify the uncertainties in this report and not to suggest approaches to reduce them, then don't make recommendations in this report. Very uneven treatment in this area.
  2. In those areas commented upon, the report dwells on redefinitions and clarifications as a vehicle for resolving uncertainties. If a regulatory requirement is not practical to implement, how can clarification or word engineering fix the problem? (See GWTT, page B-50).
  3. Some areas identified as being uncertain do not seem to actually be uncertain in the sense the original intent or definition is quite clear. It appears these instances use the "uncertainty" argument as a vehicle for changing the rule. The technical need for making a change may or may not be valid, but it is not due to uncertainty.
- cc: D. Brooks  
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