RAI Volume 4, Chapter 2.5.1, First Set, Number 5: Provide a technical basis and justification for the statement in Section 2.2.13B.7 where the applicant does not require documenting the rationale for revision to an expert's initial assessment in the expert elicitation report. (10 CFR 63.101(a)(2); NUREG-1563, Branch Technical Position on the Use of the Expert Elicitation in the High-Level Radioactive Waste Program, Section 3, Staff Technical Positions, Step No. 7, Post-Elicitation Feedback).

1. RESPONSE

Documenting the rationale for revision to an expert's initial assessment may inadvertently inhibit the critical consideration of information subsequently provided to the experts during the expert elicitation process. The U.S. Department of Energy (DOE) expert elicitation process was structured in this way to address this concern by minimizing any restraints upon the experts' ability to freely interact with each other and to prevent biasing of evaluations. Requiring experts to document deviations from their initial judgments reinforces the anchoring bias and may distort the expert's true judgment. Anchoring is a well known cognitive bias that affects judgment and estimation, wherein an individual gives disproportionate weight to an initial value (the anchor) and then adjusts the initial value insufficiently when more information is available. A documented position imposes a strong anchor, and requiring documentation of the rationale for any changes to that opinion could further reinforce that anchor by creating the impression that changes of opinion are not expected, and the original position must be defended in spite of contradictory evidence. Documenting revisions to expert evaluations can anchor the experts to their initial evaluations, making them reluctant to revise an evaluation after the feedback process.

Section 5.4 of the Safety Analysis Report (SAR) describes three expert elicitations that the DOE used to directly support the license application:

- Probabilistic Volcanic Hazard Analysis (PVHA) (SAR 5.4.1)
- Probabilistic Seismic Hazard Analysis (PSHA) (SAR 5.4.2)
- Saturated Zone Flow and Transport (SAR 5.4.3).

The DOE initiated the PVHA and the PSHA in 1995, prior to NRC publication of the technical guidance contained in NUREG-1563, and the saturated zone flow and transport expert elicitation was initiated in 1998. All three expert elicitations were conducted in a manner generally consistent with the nine-step technical guidance described in NUREG-1563.

The DOE first referenced NUREG-1563 in 1998 when, along with other documents, the DOE used NUREG-1563 as technical guidance for development of the expert elicitation methodology described in Revision 8 to the *Quality Assurance and Requirements Document* (QARD). Revision 17 of the QARD, submitted by letter on September 20, 2004 to the NRC, documented the degree of commitment to NUREG-1563, explicitly noting the variation from the portion of Step 7 dealing with documentation of intermediate revisions to experts' opinions. A separate enclosure contained the DOE justification for this variation. Subsequent correspondence from the NRC transmitted NRC questions related to Revision 17 (December 22, 2004), and a Technical Exchange meeting on this QARD revision was held on February 10, 2005. The NRC

subsequently accepted this QARD revision as documented by letter dated August 4, 2005, subject to several conditions which were unrelated to the DOE expert elicitation methodology or the variation from NUREG-1563 described in the QARD.

In 2003, the NRC published NUREG-1804, the Yucca Mountain Review Plan (YMRP), documenting NRC acceptance criteria for the repository license application. The YMRP references NUREG-1563 as the principal NRC technical guidance document for expert elicitation and requires that the DOE explain any variances from the technical guidance in NUREG-1563.

Consistent with the YMRP acceptance criterion referenced above, the DOE also documented the rationale for variation from the technical guidance in NUREG-1563 in the license application. As discussed in SAR Section 5.4, the basic premise of an expert elicitation is that assessments prepared by experts should be reviewed, discussed, and challenged by other members of the expert panel prior to finalization of the assessments. Experts evaluate data or other information using their past experience. Hypotheses are advanced that express models and conclusions consistent with the data and the experts' experience. The hypotheses are debated among peers who likely have different experience and who may interpret data differently. Using feedback from other panel members, experts may revise their original interpretations. In variance with NUREG-1563, the experts then produce a single elicitation summary rather than an initial summary supplemented by the explanations of the rationale for revisions or changes to the initial summary.

The DOE approach for varying from NUREG-1563 also is consistent with subsequent technical guidance contained in NUREG/CR-6372, *Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on the Uncertainty and Use of Experts*, on which the DOE expert elicitation methodology was primarily based. That technical guidance emphasizes that experts should be encouraged to revise their assessments in light of feedback from their preliminary assessments; and "it should be emphasized by the TFI [technical facilitator/integrator] that there is neither need nor any desire for the experts to agree with each other after having seen where their assessments stand relative to the other experts' assessments." NUREG/CR-6372 elaborates that experts will have greater buy-in to the process and will be more willing to revise their opinions based on information from different points of view if they do not feel that they are being personally attacked, which could result if experts are made to document a justification for their change of opinion. Thus, for similar reasons, the DOE expert elicitation process was designed to encourage experts to keep an open mind and to not pressure them into adopting a particular point of view.

The DOE rationale for this process was further elaborated in the PVHA-U. The PVHA-U was performed subsequent to NRC acceptance of Revision 17 to the QARD. As noted in the PVHA-U, the DOE recognizes that the recommendations for documenting the rationale behind an expert's evolving opinion derives from a legitimate concern for the effects of group dynamics on individuals' expressed judgments and the potential for one or more experts to feel pressured to modify judgments (or in the case of anchoring, not to modify judgments) counter to their true expert opinions. However, these concerns can be mitigated by including various safeguards in

the expert elicitation process. For example, the safeguards in the expert elicitation process for the PVHA-U included:

- "Interactions among experts were at workshops that were open to the public, facilitated by an experienced technical facilitator-integrator, and documented, so undue influence on an individual expert would have been seen and countered.

- Every workshop reiterated that the ultimate goal of the elicitation was not consensus on a final "aggregate" model or assessment, but that the panel's judgments represented the range of judgments among the informed technical community. The facilitators emphasized that a range of viewpoints was expected and agreement on all issues was not a goal.

- Experts were given opportunities to review and revise their judgments after the final workshop, and were not required to defend those final judgments to the rest of the expert panel, giving them opportunities to express their true expert opinions without peer pressure, even if the opinions were counter to the judgments of other panel members.

- Experts who served on the panel have agreed to be publicly associated with their assessments and the rationale behind them; hence, they feel professional obligations to a larger group (the technical community) to explain their assessments, countering pressures from group dynamics."

The DOE does not currently plan to perform additional expert elicitations in support of the repository license application. However, the DOE has maintained the commitment to NUREG-1563 in the current version of the QARD, with the conditions discussed above, in the event that future expert elicitations or updates are undertaken.

In summary, the DOE statement in section 2.2.13B.7 reflects and seeks to eliminate the potential risk of inhibiting the revisions of preliminary options resulting from feedback and free exchanges on information among the experts involved in the elicitation. For this reason, the DOE has not required documentation of the rationale for revisions to an expert's initial assessment for any elicitations performed to date. The DOE position has remained unchanged from June 1996 upon completion of the PVHA to the current requirements.

Although the DOE did not require the experts to document the rationale for revisions to their initial assessments, the elicitations did document every stage of the elicitation process. Thus, the process for developing the experts' opinions was transparently disclosed even if the individual experts were not required separately to articulate their precise rationale for evolving their individual opinions.

2. COMMITMENTS TO NRC

None.

3. DESCRIPTION OF PROPOSED LA CHANGE

None.