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May 6, 1988

Ronald Ballard
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Division of High Level Waste Mgm.
U.S. Nuclear Regulatory Commission
Mail Stop 1WFN 4-H-3
Washington, D.C. 20555

Dear Mr. Ballard:

I write in reference to the draft generic technical position on "Guidance for Determination of Anticipated Processes and Events and Unanticipated Processes and Events". I have been working under contract with the Department of Energy since 1981 on problems related to high level nuclear waste disposal. My work is focused on the hydrologic system and the impact of climatic changes upon that system. My comments on the draft generic technical position are with reference to points regarding the question of climatic change.

My comments begin with page 4 of the draft GTP. In Section 3, Technical Position, Part 1, the term maximum event is used without definition. I would caution the NRC that a maximum event in terms of a climatic change may not be the event which ultimately has a maximum impact upon the repository stability. It is conceivable, indeed likely, that some non-extreme event which is sustained for the sufficiently long period of time may have a greater impact than brief "maximum" events. This point has been discussed at a number of review sessions in preparation of the site characterization plans by the DOE.

Also, on page 4, the NRC uses a definition of the Quaternary Period which does not agree with the most recently stated definition of the Geological Society of America, DNAG Program. The accepted definition now by the Geological Society of America is that the Quaternary Period began 1.6 million years ago. The definition of Late Quaternary also does not fit with the accepted definition within the geologic community. It is generally accepted that the Late Quaternary began approximately 130,000 years ago at the Sangamon Interglacial, the beginning of the Late Pleistocene. The definition used by the NRC would include the mid-Pleistocene.

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On page 5, item 5, the NRC classes all events which are random processes and events as anticipated processes and events. Expert opinion undoubtedly will vary widely on this point. Use of every process that qualifies as random would be extreme since many processes which have an extremely low probability, far below that which anyone would consider to qualify them as being of interest to the Nuclear Regulatory Commission would automatically be considered an anticipated event. This would lead to a wasteful evaluation of events.

On page 9, the NRC indicates that identification of processes and events must start from a deterministic basis. This is unduly restrictive in the evaluation. There is no known deterministic mechanism which is capable of explaining the climatic variability which the earth has experienced during the Quaternary Period. Thus, restricting consideration of climate change to those which can be explained on a deterministic basis will rule out all consideration of climate change. It will be no benefit to the NRC in limiting its considerations to those which can be based on deterministic reasoning. Modern science does not subscribe to the deterministic reasoning which is so commonly presented to non-scientists in their training at introductory levels. In the footnote (8) the concept of a deterministic method is equated with empirical methods. This illustrates the weakness of the conceptualization here. If purely empirical methods are to be allowed, as is most reasonable, it is of no benefit to label them deterministic.

On the top of page 10 it is indicated that the Quaternary record and especially the Late Quaternary record provides the best basis for projecting geologic events. In the case of climatic change this is almost surely not the case. The anthropogenic influences such as increased carbon dioxide clearly tell us that future climates cannot be considered to be analogs of events which have happened in the Quaternary Period. No climatic change during the Quaternary Period can be considered the basis for the kinds of projections of climatic change that will be required in order to understand future climates that have been impacted by anthropogenic influences. It will only muddy the waters and limit any clear approach to the problem of projecting future climate change by implying that projections based on the Quaternary record will be sufficient.

On page 16, the NRC indicates that the greenhouse effect would be considered "if the climatic model assumed in the analysis warrants" consideration. Present scientific understanding of the greenhouse effect would not allow projections of future climate without such consideration. The NRC would do a disservice to the scientific community to suggest that such an option is available. Of course, it is quite conceivable that at some point scientific inquiry could

demonstrate that the greenhouse effect need not be considered. At present, however, the preponderance of evidence makes it clear that such effects must be considered and it is a poor example to use in the generic technical position to imply that the greenhouse effect might be discarded. Other, much more trivial examples where discarding an hypothesis might be reasonable could be included here in its place.

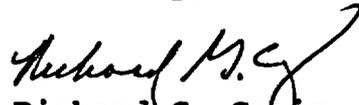
In the second paragraph on that same page, the NRC uses the example of the model of Imbrie and Imbrie (1979). This is an extremely non-technical presentation of climatic theory to a general audience. It should not be taken as an example of current scientific thinking about future climatic change. Indeed, even within that reference there are inconsistencies in the projection of future climates. Moreover, that reference does not give an explanation of how the future climate projection was made nor does it describe any of the uncertainties that are included in such a projection in such a way that the impact on that projection can be comprehended by the general reader. Other, more up-to-date and more inclusive climatic theories should be employed by the NRC as an example in this case. Again, the conclusions reached by the NRC that it is not reasonably likely that a glacial extreme could be reached in the next 10,000 years is not the kind of careful representation of considerations that should be presented in a generic technical position. The NRC should reevaluate the wording in this case to make it more clear that, at least at this point, the question remains open whether such extremes can occur.

On the bottom of page 17, the NRC makes the statement that silicic volcanism has not occurred during the Quaternary Period. This is assumed to apply to the geologic setting. The geologic setting itself is not defined within this document. If it is recognized that climatic changes are of consideration and that the climatic changes led to a lake forming in Death Valley during the Quaternary Period and that lake was fed by lakes upstream which included the drainage of the Owens Valley and that the Owens Valley did suffer several examples of silicic volcanism during the Quaternary Period, than this statement would be false. In this case the geologic setting (including the hydrologic regime) would have to be extended to include the Owens Valley which did suffer silicic volcanism. The fact that a major caldera eruption formed in the Owens Valley during the Quaternary Period, indeed near the beginning of the lake Quaternary according to the definition of the NRC given in this document, suggests that silicic volcanism should be considered as a credible phenomena and at least classified as a unanticipated process or event.

I would suggest that the NRC reconsider the contents of the generic technical position with regard to questions related to climatic change. The NRC should consider obtaining additional

expert advice concerning questions related to climatic change and should consider rewording the draft generic technical position to take into account current understanding and variations in the climatic system during the Quaternary Period and possible changes in the climatic system due to anthropogenic forces.

Sincerely,



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