Department of Energy
Washington, DC 20585

Rec'd from J. Dorn

FEB 18 1987

Honorable Edward J. Markey
House of Representatives
Washington, D.C. 20515

Dear Mr. Markey:

We have carefully reviewed your letter of October 20, 1986, and the accompanying staff memorandum entitled "Preliminary Results of Staff Investigation into DOE's Selection of Three Sites for Characterization as the Nation's First Repository for High-Level Radioactive Waste." While we appreciate your interest in understanding and analyzing the decision process, we are dismayed by the comments made in these documents. After careful analysis, we conclude that, almost without exception, the findings of your staff's investigation are without basis.

The enclosed paper presents a point-by-point response to the principal points made in your letter and your staff's memorandum. I would like to summarize the principal conclusions here and attempt to clarify the role of the multiattribute utility analysis (MUA) in our decision since there is a consistent misinterpretation of its role in the staff memorandum.

Perhaps most important, we believe that you have not presented any credible evidence to substantiate criticisms that the Department of Energy (DOE) distorted and manipulated the MUA to produce a desired result--because none exists. No technical results whatever of that analysis were changed to promote or downgrade any site. Furthermore, state-of-the-art techniques were used to minimize the potential for conscious or unconscious biases to affect the results, and the Board on Radioactive Waste Management of the National Academy of Sciences (BRWM/NAS) stated that they found no evidence of bias in DOE's implementation of the methodology.

With respect to the comment that DOE edited the methodology and recommendation reports to suppress information unfavorable to the Hanford site or to the Deaf Smith site, we believe that the best measure of DOE's actions is not what passages were deleted from drafts during editing, but rather what passages remained in the final published reports. Our review of the language you indicate was removed from early drafts shows that in most cases language very similar in substance -- in some cases verbatim language -- was retained in the final reports. The remaining deletions were made for legitimate editorial reasons, most often to eliminate redundancies. Some deletions were also made to remove inappropriate judgments, for example, about which sites to characterize

or about the significance of differences among the sites, that overstepped the bounds of the decision-aiding role of the MUA. An excellent example of such an inappropriate judgment is found in the quote that appears at the top of page three of your letter of October 20.

Finally, we disagree that rock-type diversity was the sole basis for our selection of Hanford, and that we should have included that factor explicitly in the methodology. Diversity was clearly an important consideration. Indeed, the Nuclear Waste Policy Act of 1982 (the Act) itself requires DOE to recommend sites for characterization in different rock types "to the extent practicable," and diversity provides a number of important benefits, including insurance against the possibility of common-mode problems that could affect all sites in a given rock type. But diversity was not the only consideration. As the MUA indicates, Hanford is expected to have excellent postclosure performance, and the lowest adverse impacts on the community and environment in the vicinity of the site.

Because rock-type diversity is a property of portfolios of sites, while the MUA compared sites in terms of their individual characteristics, diversity could not have simply been "included in the methodology, so it could have been considered and weighted along with the other factors," as you suggest. A rigorous, formal evaluation of the effects of diversity would have required an additional, more complex form of analysis involving highly speculative judgments about such things as future licensing actions. Instead, we considered the portfolio effects qualitatively, as is commonly done in other portfolio-type problems. Such an approach is entirely consistent with the Act and the DOE siting guidelines.

In addition to responding to these specific comments, I would like to clarify a misunderstanding that permeates both your letter and your staff's analysis and that leads to many erroneous conclusions and inferences. This misunderstanding relates to the capability and role of the MUA in the decision process. That you view the MUA to be something that it is not is revealed by references in your letter to the MUA as a "more rigorous selection methodology," and in the statement that "DOE distorted and disregarded its own scientific analysis in order to support selection of the Hanford, Washington, site and to avoid selection of the Richton Dome, Mississippi, site." These statements indicate a belief that the MUA is capable of providing a "scientific" ranking of the five nominated sites -- a ranking somehow devoid of judgment -- which should then be used as the sole basis for selecting three for characterization. Without this fundamental premise, there are no logical grounds for criticizing DOE for not selecting the three top-ranked sites identified by the MUA, or for inferring that DOE "ignored" the

results of the MUA. Indeed, without that premise, there is no incentive for DOE to engage in all of the "manipulations" and "distortions" you believe were undertaken to promote Hanford into the top three sites.

This basic premise is false. The methodology was never intended or designed to make the decision about which sites to characterize, only to aid the responsible decision-maker, the Secretary of Energy, by providing insights about the advantages and disadvantages of the sites. There was no presumption that the three sites ranked highest by the MUA should be the three selected for characterization, and thus no need or incentive to manipulate the MUA to promote any supposedly favored site into the top three.

Limiting the role of the MUA in the decision process is appropriate for four important reasons. First, as attractive as it might be to shift the burden of decision to a "scientific decision methodology" (a phrase used in your staff memo to describe the MUA), no such methodology exists. As the BRWM/NAS stated in its review of the MUA, "there is no single, generally accepted procedure for integrating technical, economic, environmental, socioeconomic, and health and safety issues for ranking sites." The guidelines do not specify any particular method for ranking sites. Indeed, the idea of an "objective" numerical method for "computing" siting decisions was discussed and rejected in the final decision about the guidelines. We could find no support in the technical community for such a method and were unable to determine a framework that would be sufficiently complete to eliminate the exercise of judgment on the part of Federal officials who make the siting decisions. In its April 2, 1984, letters to DOE and the NRC concerning the draft siting guidelines, the BRWM/NAS said: "The combination of complexity and uncertainty [in the repository siting problem] implies that DOE must be accorded substantial discretion to exercise its best technical judgments in recommending three of the nominated sites. . . ."

Second, the MUA, like any such methodology, involves the simplification of a complex reality. It is capable of providing only a partial and approximate accounting of the many factors important to the site-recommendation decision. Basing siting decisions solely on the numerical results of an unavoidably limited formal analysis would be improper. These are decisions about real sites that affect unique communities and people, not about mathematical abstractions. No amount of analysis would relieve DOE of the ultimate responsibility to make its decision based on consideration of the full range of data and information in the Environmental Assessments (EAs).

Third, the significance of the aggregate ranking produced by the methodology must be tempered by an appreciation of the relatively limited data available before characterization. For example, the cost estimates used in the MUA are based on current system designs that may change significantly as a result of the information gained during site characterization and of later decisions about the overall waste-management system (e.g., construction of an MRS). A geologic repository is a first-of-its-kind engineering task, and it is wise to be modest about our ability to predict the ultimate design that will emerge at the end of the licensing process (also a first-of-its-kind enterprise). The range of uncertainty on costs incorporated in the MUA does not include uncertainty about system design, only the types of uncertainties inherent in any large construction project with a given design. Uncertainties not accounted for in the MUA, such as the possibility of as-yet-unidentified factors, may ultimately overshadow current estimates of site differences.

Finally, any methodology for ranking sites based on their individual attributes would be unable to fully take account of the important factor of rock-type diversity, which is an attribute of sets of sites rather than of individual sites. As discussed earlier and in the enclosure to this letter, there is no a priori reason for concluding that the three sites that rank at the top when the sites are considered individually would make up the best set of three for characterization when diversity is taken into account. Thus there are no logical grounds for concluding that failure to select the top-ranked three sites is prima facie evidence of flawed decisionmaking.

In summary, because of the limitations of this or of any formal methodology that might be used to model the key factors in a decision problem, it is necessary to supplement the insights gained from the methodology with professional experience and judgment. That the methodology must be decision-aiding and not decision-making has been stressed by DOE from the beginning and was unequivocally endorsed by the BRWM/NAS in its review letters to DOE. Since the MUA was never intended or designed to make the decision, all of the criticisms based on the incorrect premise that it was, are unfounded.

Despite its limitations, the application of a formal methodology as part of the decision process provided a number of important advantages. Unlike the simpler methods used to rank the sites in the draft EAs, the MUA produced quantitative estimates of the performance of each site on each siting factor specified in the guidelines. Combining these estimates with the explicit value judgments required by the analysis gave valuable insights into the importance of the differences among the sites. For example, it showed that all of the sites are expected to release radioactive materials at levels that are very far below the levels allowed by EPA standards, and that the differences between the sites are not significant.

Furthermore, the MUA makes the process of analysis explicit and open to review. It clearly separates the technical judgments about the performance and impacts of a repository at the various sites from value judgments about the desirability of those possible impacts, and makes both types of judgments explicit. This makes it easy for readers to determine which judgments are important to the conclusions of the analysis and which are not, and allows them to test the implications of different value judgments and technical judgments. DOE does not expect that everyone will agree with all of the assumptions and judgments included in the analysis. However, DOE believes that it is very valuable to have those assumptions and judgments stated clearly and precisely, so that others can evaluate them and see whether their own judgments would lead to significantly different conclusions.

In conclusion, the responses we have provided here and in the enclosed paper demonstrate that all comments related to developing the MUA after having fixed immutably on a predetermined set of sites, as well as comments related to manipulation of results, are without foundation. We do not believe that the open and well-documented process by which DOE has approached the selection of sites for characterization should damage the credibility of the repository program. Quite the contrary, the fact that the Subcommittee staff was able to critically analyze the decision demonstrates the unprecedented openness of the decision process. For these reasons, we must reject your statement that the site-recommendation decision is "seriously flawed and totally unsupportable."

Further, we believe any additional analysis beyond what was done to support the May 28 decisions would not be cost-effective. We have seen nothing to indicate that application of a formal portfolio analysis would reveal important new insights that would warrant reconsideration of our decision. We believe that the best way to enhance credibility at this time is to get on with the important job of gathering detailed data about the three sites, as mandated by the Act, rather than to continue to analyze the limited data that are available before characterization.

I would welcome the opportunity to discuss these points with you further at your convenience.

Sincerely,

Ben C. Rusche

Ben C. Rusche, Director
Office of Civilian Radioactive
Waste Management

Enclosure

Department of Energy
Washington, DC 20585

FEB 18 1987

Honorable Ron Wyden
House of Representatives
Washington, D.C. 20515

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Office of Civilian Radioactive
Waste Management

Enclosure

Department of Energy
Washington, DC 20585

FEB 18 1987

Honorable Al Swift
House of Representatives
Washington, D.C. 20515

Dear Mr. Swift:

We have carefully reviewed your letter of October 20, 1986, and the accompanying staff memorandum entitled "Preliminary Results of Staff Investigation into DOE's Selection of Three Sites for Characterization as the Nation's First Repository for High-Level Radioactive Waste." While we appreciate your interest in understanding and analyzing the decision process, we are dismayed by the comments made in these documents. After careful analysis, we conclude that, almost without exception, the findings of your staff's investigation are without basis.

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Enclosure

ENCLOSURE

Comment 1: DOE deliberately misled the Congress as to the existence of documents.

DOE did not deliberately mislead the Subcommittee on Energy Conservation and Power as to the existence of draft working documents of either the methodology report or the recommendation report. DOE did not retain working drafts in its general office files. Such a procedure is routine and consistent with DOE directives not to retain such materials. In some cases, working drafts of these documents were retained in the personal files of individuals intimately involved with writing or reviewing these documents. All retained documents, whether in official or personal files, were made readily available for the perusal of the Subcommittee staff and, for its convenience, were categorized and filed at one central location at DOE.

Comment 2: DOE systematically and deliberately distorted, suppressed, and manipulated its own scientific data and analysis in an effort to promote the Hanford site and to downgrade the Richton Dome site.

The statement that DOE systematically distorted and manipulated data, that is, technical and value judgments, in working drafts of the methodology report is false. No technical results whatsoever were changed to promote the Hanford site or downgrade the Richton Dome site or any site for that matter. To check this statement, the Subcommittee is invited to compare data contained in the March 17, 1986, submittal to the Board on Radioactive Waste Management of the National Academy of Sciences (BRWM/NAS) with data in the final methodology report. The estimates of preclosure impacts for the Richton Dome site, for example, are exactly the same in the two documents (cf. Table 4-9 in the March 17 submittal with Table 4-8 in the final methodology report).

The Subcommittee further contends that the fact that the preparation of the methodology and recommendation reports overlapped to some degree is evidence of wrongdoing. We disagree. The methodology report was in large measure complete -- certainly the major insights had been communicated to the Director, OCRWM -- by the time the first meeting discussing the need for the recommendation report was held on April 4, 1986. In any case, since the methodology was never intended or designed to make the decision, we do not regard the parallel preparation of the two documents as irregular.

Irrespective of the timing issue, the central question is whether, by deletions, DOE suppressed information about the estimated deficiencies of the Hanford site. We submit that a truer, more accurate measure of whether information was suppressed is not what passages were deleted during the routine

editing process but rather what passages remained after that process. The following passages from the final methodology report demonstrate clearly that comments related to suppressing unfavorable information about any of the sites are unfounded.

> Pg. 3-43, first paragraph: "From the relative ranking of the sites and estimates of uncertainty, it appears that the postclosure performance of a repository at the Hanford site would be slightly less favorable than that of a repository at the salt sites or at the Yucca Mountain site."
>
> Pg. 4-36, fifth paragraph: ". . . The overall preclosure ranking is Yucca Mountain, Richton Dome, Deaf Smith, Davis Canyon, and Hanford. In terms of equivalent-consequence impacts, the difference between Yucca Mountain and Richton is the equivalent of 1119 million dollars, between Richton Dome and Deaf Smith 640 million dollars, between Deaf Smith and Davis Canyon 1127 million dollars, and between Davis Canyon and Hanford 2552 million dollars."
>
> Pg. 4-37, first paragraph: ". . . the relative [preclosure] ranking of sites obtained for the base case is totally insensitive to any changes in the level of impacts except for costs. Furthermore, the ranking is insensitive to any reasonable changes in the value judgments or in the form of the utility function."
>
> Pg. 5-4, third paragraph: ". . . certain patterns are clear and stable under a wide range of assumptions. The Hanford site is in all cases ranked fifth. . . ."
>
> Pg. 5-16, first paragraph: "This ranking [referring to the overall ranking of Yucca Mountain, Richton Dome, Deaf Smith, Davis Canyon, and Hanford] is stable except for the most extreme weightings of postclosure versus preclosure performance."

Other sentences stating estimated deficiences of the Hanford site appear in Chapters 3, 4, and 5 of the final methodology report.

On review of statements like those quoted above, Dr. Frank L. Parker, Chairman of the BRWM/NAS, in a letter to Congressman Weaver dated November 6, 1986, stated:

> "In view of these summary statements, I cannot possibly agree with Findings 5, 6, and 7 that state that the MUA was 'distorted,' 'flawed,' and 'contrived,' to place Hanford high in the list of sites to be characterized."

While it is true that during the course of developing the methodology report passages were both added and deleted from working drafts, these changes were appropriate because they were all directed at improving the quality of the report. As in any writing job, critical reviews of drafts by people other than the primary authors (i.e., others on the MUA team and DOE management) identified numerous opportunities for improving readability by clarifying, shuffling, reorganizing, and, in some instances, deleting text. Specifically, DOE deleted passages to eliminate: 1) redundancies, 2) unsupported or overstated conclusions, 3) inappropriate value-laden language, and 4) unnecessarily complex language. The fact that redundancies should be minimized needs no elaboration. The importance of the other criteria for deleting text and examples are discussed below.

The quote that appears at the top of page 3 of the Congressional letter of October 20 provides an example of an unsupported statement that appeared in working drafts of the methodology report. This paragraph was properly deleted because it could not be supported by the results of the MUA. Because the MUA compared the sites on an individual basis rather than as portfolios, it is not possible to conclude from it alone what set of three sites should be characterized. In addition, several statements in the deleted passage contained value-laden remarks, such as a conclusion that a difference was "substantial." Other examples of value-laden words that were generally deleted or modified are "significant" and "reasonable." We believed that value judgments about the significance of the results were best left to the Secretary as the decisionmaker and that such judgments should appear in the recommendation report, not in the MUA. In sum, this paragraph and similar deleted passages overstepped the bounds of the role of the decision-aiding methodology.

An example of unnecessarily complex language that was deleted appears on page\29 of the staff memorandum. The deleted passage appeared in the conclusions section of Chapter 4, the preclosure analysis of the sites, and concerned the probability for a significant correlation in total costs among the sites. The passage was deleted because it seemed out of place inasmuch as the section was intended as a summary of conclusions. This detailed, technical point had been covered earlier in the main text of the chapter.

In summary, the central contention of the Congressional letter and staff analysis is false. A cursory comparison of language in early drafts of the methodology report against the final report shows that, in most cases, verbatim language, or language very similar in substance, was retained. Deletions were made for proper and legitimate reasons. Such facts lend no credibility to the Subcommittee's comments related to tailoring the final methodology report to suit a predetermined choice of sites.

Comment 3: DOE biased weighting factors in the MUA to promote the selection of the Hanford site.

This comment is without foundation. In fact, great care was taken to safeguard against bias and manipulation of the methodology. First, by judicious selection of people, DOE ensured that no individual providing input to the methodology had any professional or economic incentives for the selection or rejection of a particular site. All judgmental inputs were the joint responsibility of many individuals, thereby diluting the influence of any single individual and creating a situation where individual bias would be apparent through comparisons across individuals. Second, care was taken to maintain separation between individuals making scientific judgments (e.g., probabilities of disruptive scenarios) and those making policy or value judgments (e.g., weighting factors). Such a division of labor is recommended by the National Academy of Sciences* and in the professional decision-analysis literature.

Third, formal state-of-the-art assessment techniques designed to minimize bias were used to obtain inputs to the methodology. These assessments were highly detailed and disaggregated, so much so that a computer was required to aggregate and analyze the implications of individual assessments. As a consequence, at the time at which the assessments were made, the implications for overall rankings were very difficult for the individuals providing the judgments to determine. Finally, all judgments were required to be supported by an explicit logic. Particularly controversial judgments, such as value tradeoffs between dollars and fatalities, were compared whenever possible with the values recommended for or implied by other Federal-agency decisions.

Thus, while it is true that an individual biased toward or against a site might have an idea how to alter any given judgment to manipulate results, the above safeguards would minimize the effect as follows:

- The requirement that all judgments be justified in terms of logic and information in the Environmental Assessments (EAs) limits the extent to which any input could be successfully biased.

- Due to the complexity of the MUA model it would be extremely difficult for a participant to know which of his inputs, if biased, would have an effect on conclusions.

*National Research Council, 1983. Risk Assessment in the Federal Government: Managing the Process, Commission on Life Sciences, National Academy of Sciences, Washington, D.C.

- Due to the extensive opportunities for crosschecking to identify inconsistencies, any bias in judgments would have to be kept small to avoid making those biases obvious to other participants.

- Since any individual provided only a small fraction of the necessary inputs, that person's ability to influence conclusions would be small.

Finally, in further support of this position, we note that the BRWM/NAS said they saw no indication of bias in DOE's implementation of the methodology (see April 10, 1986, letter from F. Parker to B. Rusche).

Comment 4: DOE, in disregard of its own siting guidelines, arbitrarily disregarded siting factors such as total costs in an effort to promote the Hanford site.

The available evidence clearly indicates that DOE disregarded no siting factors in making the site-recommendation decision. To the contrary, the Secretary considered the full range of results and insights derived from the application of the methodology, one of which was that costs dominated whenever individual factors were aggregated. The result that costs would so completely dominate the overall rankings of sites was initially surprising and, frankly, somewhat unsettling as these costs must be regarded as very preliminary, at best. This point deserves some elaboration.

The cost estimates assumed in the methodology report are based on the current report on the total-system life-cycle costs. Although this was the best information available at the time, these estimates were considered more indicative than substantive because they are based on preconceptual repository designs. Moreover, these preconceptual designs are for a first-of-its-kind engineering project. These factors suggest a high potential for major design changes, with concomitant shifts in cost estimates. For example, cost estimates for the salt sites have assumed contemporaneous waste emplacement and backfill, thereby shortening by many years the repository-operations period relative to the Hanford site. (The long operations period assumed for the Hanford site is a significant contributor to its undiscounted cost.) If such an assumption were disallowed by the NRC, the cost estimates for the salt sites would increase significantly, perhaps even above those for Hanford. Very recent cost information still under review in OCRWM confirms the potential for major swings (upwards of a billion dollars) in repository costs.

Such basic and unpredictable system-design factors as these led the Secretary to temper consideration of costs with other considerations. Discomfort over the dominant effect of costs on the MUA results was apparently shared by the BRWM/NAS. In their letter of April 10, 1986, to the Director, OCRWM, they stated:

"On the basis of the Board's review of the application to a single site, it appears that the expected total repository and transportation costs will have a major, if not controlling, effect on the rankings under pre-closure factors. This recognition of the heavy dependence on cost reinforces the Board's judgment that the principal usefulness of the multi-attribute utility method is to illuminate the factors involved in a decision, rather than to make the decision itself." [Emphasis added.]

Not only were all factors considered in making the decision, but they were accorded their proper weight consistent with provisions of the siting guidelines. The relative importance provisions in the siting guidelines are qualitative and reflect general perceived values of society. This is in contrast to the quantitative information required for the MUA. DOE gave operational meaning to the qualitative guidance by ensuring that value tradeoffs -- judgments of relative importance -- be consistent with a conservative philosophy in which costs are among the least important and public health and safety are most important. Such an approach is consistent with the guidance from the BRWM/NAS and from other independent reviewers of the methodology (see letter dated December 20, 1985, from M.R. Sampson and R.\Jim, Yakima Indian Nation, to B. Rusche).

In summary, all factors specified by the siting guidelines were considered by the Secretary in making the site-characterization decision. This position is supported by other outside reviewers of the methodology and recommendation reports (see pg. 2 of letter, dated November 6, 1986, from F. Parker to Congressman J. Weaver).

Comment 5: DOE deliberately did an incomplete multiattribute utility analysis for fear that a complete analysis would not support the selection of the Hanford site.

We discuss here two aspects of this comment: (a) the omission of explicit consideration of nonfatal health-and-safety impacts in the MUA, and (b) the decision not to perform an additional portfolio analysis to take into account rock-type diversity.

Consideration was given to nonfatal health-and-safety impacts in Section 4.6.4 of the methodology report. As explained in the report, the effect of including nonfatal impacts would be to give greater weight to the health-and-safety related objectives relative to the other objectives. Just such a sensitivity analysis is described in Chapter 4 of the methodology report (see Table 4-16), where it is argued that the inclusion of such impacts would not change the overall ranking of sites (although the spread between sites changes) because of the overwhelming dominance of costs.

With regard to the judgment not to perform the additional portfolio analysis needed to consider the effects of rock-type diversity, we acknowledge that such an analysis might possibly have provided additional insights about the relative desirability of portfolios of three sites. As in any formal siting study, decisions had to be made about what and what not to include in the formal analysis. It was our judgment that the extra time, cost, and effort necessary to perform a formal portfolio analysis was not required to make a responsible decision. A rigorous, formal evaluation of the effects of diversity would require a more complex form of analysis involving highly speculative judgments about such things as future licensing actions. Instead, we considered the portfolio effects qualitatively, as is commonly done in other portfolio-type problems. We believe such an approach is entirely consistent with the Act and the siting guidelines.

Professor Ralph L. Keeney, who participated in the development of the MUA, has on his own initiative recently conducted a partial portfolio analysis.* While we disagree with the conclusions and recommendations Professor Keeney derives from his new analysis, we believe it supports the long-standing principle that diversity should be an important factor in siting. Furthermore, we believe that the results of the analysis support our conclusion that a formal portfolio analysis would not yield major new insights that would lead to a different choice of sites.

Related to this point is the role diversity played in the decision to select Hanford for characterization. It is clear from the Congressional letter that this role was misunderstood. Consideration of the potential benefits of diversity was certainly a factor in the decision. Although the arguments for diversity have traditionally been along the lines of avoiding common-mode failure during the postclosure period, we believe the potential advantages to be far broader in scope. For example, characterizing sites in diverse geologic environments increases the likelihood of being able to consider later in the siting process a wider range of repository-design alternatives and innovative ways to ensure compliance with regulatory requirements than would otherwise be possible. Examples are whether and when to backfill repository openings and ways to ensure that retrievability requirements can be met.

However, diversity was not the only factor. The facts that there is no practical difference in the excellent predicted postclosure performance of the five sites and that the preclosure ranking is dominated by costs were also important. Diversity considerations

*R.L. Keeney, November 1986, "An Analysis of the Portfolio of Sites to Characterize for Selecting a Nuclear Repository," University of Southern California Decision Analysis Series.

confirmed that the set of three sites offered on balance the most advantageous combination of characteristics for successful development of repositories, as required by the siting guidelines.

Comment 6: DOE deliberately ignored advice from the Board on Radioactive Waste Management of the National Academy of Sciences in doing the multiattribute utility analysis and in making the site-recommendation decision.

We address here three parts to this comment: (a) DOE ignored the BRWM/NAS by allowing the siting guidelines to distort the weights accorded each siting factor; (b) DOE ignored the BRWM/NAS recommendations involving participation of outside experts; and (c) DOE ignored consideration of the relative vulnerability of the accessible environment at each site. DOE did not ignore these or any of the recommendations of the BRWM/NAS. Rather, DOE considered all recommendations very carefully, and, in fact, made many changes to the methodology and recommendation reports in response to these recommendations. It is true, however, that for various reasons, DOE decided not to follow all of the recommendations of the BRWM/NAS regarding the MUA, as explained below.

DOE did not allow the siting guidelines to distort the weights accorded siting factors in the MUA. The relative importance provisions in the siting guidelines were interpreted qualitatively, and were reflected in the analysis by ensuring that the quantitative value tradeoffs required by the MUA were consistent with a conservative philosophy that reflected general values of society. As discussed above, this did not involve eliminating costs from the analysis.

With regard to the merits of including outside experts in its implementation of the methodology, we recognize that the use of such people might have enhanced the credibility of the process. DOE decided not to directly involve outside experts in its implementation of the methodology for the following reasons:

1. DOE recognized from the outset the controversial nature of some of the judgments required as input to the methodology, for example, weighting factors. Accordingly, DOE performed numerous sensitivity analyses to examine how the site evaluations depended on the inputs to the model. These analyses roughly approximate differences in opinions and values of different groups and stakeholders interested in repository siting.

2. DOE staff and consultants were among the best qualified for providing the types of information required by the methodology. Further, DOE has the responsibility and the authority for making these judgments pursuant to the Act.

3. Other stakeholders have had several opportunities to influence the implementation of the methodology, albeit indirectly, by their involvement in the development of the siting guidelines and by reviews of the simple ranking methods presented in the draft EAs. Public-comment periods and rounds of consultation with interested parties on these documents did much to influence the specification of both the siting objectives and the value tradeoffs among objectives used in the methodology, which are the fundamental building blocks of the methodology.

4. Pursuant to requests from the public and the Congress, DOE did elicit an independent review of the methodology and its application from the BRWM/NAS. While this group said they were disappointed DOE did not involve outside experts, they also said they saw no indication of bias in DOE's implementation of the methodology.

In view of these factors, DOE did not directly involve all possible stakeholders. We believe this action balanced the requirements of the Act for State and public participation in the siting process against the requirements of the Act to continue to make timely progress toward repository development. Moreover, given the extensive sensitivity analyses, we doubt that the involvement of outside experts would have provided fresh insights into the MUA.

The last part of the comment concerns the idea that DOE should have considered the relative vulnerability of the accessible environment at the various sites. The concept of setting regulatory limits for releases of radioactivity to a universally applied accessible environment rather than for the predicted consequences of those releases is fundamental to the final Environmental Protection Agency's rule for disposal of nuclear waste. This rule was the subject of frequent interactions with the public and with independent scientific groups, including the BRWM/NAS, and took almost nine years to develop. A study* published in April 1983 by a special panel of the BRWM was critical of the radiation-release limits approach of the then-proposed EPA rule; the panel advocated instead an individual-dose limits approach. Although the EPA eventually added an individual-dose limit to its now-final rule, the release-limits approach is still the mainstay of the rule. EPA's rationale for emphasizing estimates of amounts of radioactivity released rather than individual exposures is that it avoids highly speculative predictions of future environmental pathways, behavioral patterns, and population distributions that determine how

*National Research Council, 1983. A Study of the Isolation System for Geologic Disposal of Radioactive Wastes. Report of the Waste Isolation Systems Panel, Board on Radioactive Waste Management, Commission on Physical Sciences, Mathematics, and Resources, National Academy of Sciences, Washington, D.C.

releases result in doses received by people. Such an approach will make demonstrations of compliance with the standards more straightforward. DOE as well as a special Science Advisory Board to the EPA generally agreed with these technical aspects of the standards.

Consistent with past DOE positions and with these regulations, DOE adopted a postclosure performance measure based on releases, not health effects. Not surprisingly, the BRWM/NAS disagreed with the measure, as it is the same as the EPA's. While the BRWM/NAS understood the DOE's position on this difficult issue, it advised that by ignoring current differences in accessible environments the DOE was ignoring a potentially important site discriminator. DOE agreed to consider differences in accessible environments only so far as such consideration was consistent with the EPA rule, and to do so in the final recommendation report.

Accordingly, DOE reviewed estimates of releases to the accessible environments at the various sites and observed that such releases are not expected to discharge to the Earth's surface or to surface-water bodies during the next several thousand years (see pg. 4 of recommendation report). Thus, differences in accessible environments among the sites are not discriminating.

Comment 7: DOE deliberately ignored other information, outside of the multiattribute utility analysis, potentially damaging to the Hanford site.

Early in the process of documenting the methodology, DOE considered whether to include "other information," for example, risk of disqualification, in what became the methodology report. Before the decision regarding the inclusion of this information was made, rough drafts of this "other information" section, written by DOE consultants, were circulated to a few DOE people for review. On review of these materials, it became clear that all factors identified as "other information" had already been or were being addressed adequately in the EAs, the methodology report, or the recommendation report. Therefore, to avoid double-counting, these other factors were not considered again in a separate chapter.

(ES-1323.14 Rev 1 (8-79))

U.S. DEPARTMENT OF ENERGY

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LETTER: X MEMO: _ TWX: _ OTHER: _____ TO: SECY: X DEP SEC: _ UN SEC: _ OTHER: _____

FROM: O-MULTI 04

SUBJ: NUCLEAR WASTE REQUESTS DOE RESPOND TO ISSUES IN LETTER REGARDING WASTE PROGRAM INCLUDING SCHEDULE FOR REEVALUATING FIVE SITES

REMARKS: THIS IS A HIGH PRIORITY ITEM. DUE DATE MUST BE MET. MA-293 WILL OBTAIN CONCURRENCES. FINAL RESPONSE OR INTERIM MUST REACH THE EXECUTIVE SECRETARIAT BY THE DUE DATE.

FOR USE BY ACTION OFFICE ONLY

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ACTION TO: RW TYPE ACTION: Coordinate and reply direct SIG OF: RW

CONCURRENCE: CP/30 GC EH

INFORMATION: S DS US 06/GRAY CP/1 MA/29 DO/4

FILE CODE: CCMULTI-ES86015843 CONTROL ANALYST: Maria Brown....

ALL DOCUMENTS FOR OSE PRINCIPALS
MUST BE FORWARDED TO ES FOR FINAL PROCESSING
MA-293

Congress of the United States
House of Representatives
Washington, D.C. 20515
October 20, 1986

The Honorable John S. Herrington
Secretary
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20555

Dear Secretary Herrington:

On May 28, 1986, you recommended three sites in the western United States to be characterized for possible use as the nation's first high-level radioactive waste repository. The sites recommended are located in the States of Nevada, Texas and Washington. The two sites which were rejected are located in Mississippi and Utah.

The decision to select a permanent waste repository must be based on the soundest scientific and technical judgments possible. Yet we have found conclusive evidence, in many cases supplied by DOE's own internal documents, which lead us to only one possible conclusion: DOE distorted and disregarded its own scientific analysis in order to support selection of the Hanford, Washington site and to avoid selection of the Richton Dome, Mississippi site.

DOE documents obtained by the Subcommittee on Energy Conservation and Power, and the Subcommittee on General Oversight, Northwest Power, and Forest Management, reveal that DOE systematically deleted unfavorable information concerning the desirability of the Hanford, Washington and the Deaf Smith County, Texas sites. It is clear that the initial DOE draft documents told it like it is, and subsequent drafts told it like DOE wanted it to be.

Furthermore, it appears that DOE manipulated data, weighting factors and analytic techniques to arrive at a predetermined set of sites. In addition, DOE ignored findings and recommendations or its own technical staff and the National Academy of Sciences (NAS) and misconstrued the Nuclear Waste Policy Act.

It is also evident from this investigation that DOE misled the Subcommittee on Energy Conservation and Power as to the existence of DOE documents. You informed the Subcommittee on July 8, 1986, that all drafts of the recommendation report were routinely destroyed; however, numerous drafts of the report were discovered in DOE files during the course of this investigation.

Before reviewing in more detail the contents of the draft DOE documents, and the initial findings of our investigation, we believe a brief summary of events leading to this point are in order.

In December 1984, DOE issued draft environmental assessments which tentatively selected the Yucca Mountain, Nevada, the Deaf Smith County, Texas, and the Hanford, Washington sites for characterization. However, the selection methodologies which led to that final order were severely criticized by the NAS's Board on Radioactive Waste Management and others, and as a result, DOE went back to the drawing board to find a new and defensible methodology.

On April 10, 1986, the NAS finished its review of the new methodology and draft chapters of the Methodology Report which described DOE's implementation of the methodology. Through April and May, however, DOE continued to edit chapters from the Methodology Report. These chapters were materially and substantially changed during this period following the NAS review. In early May, DOE finalized the Methodology Report and in late May, the Recommendation Report was completed.

In response to your recommendation announcement on May 28, 1986, our Subcommittees embarked on an investigation of the decision process which led you to recommend the final three sites. The most immediate focus of the investigation was to determine why the site placing fifth and last in the metholodology, the Hanford site, was chosen as one of the three finalists; and why the very same three finalist sites which you recommended in your seriously flawed and discredited December, 1984, draft environmental assessments, were once again chosen by DOE in 1986, despite the contrary results of the new and more rigorous selection methodology.

As you know, the methodology report was supposed to present the unbiased and unadulterated evaluation of the five sites under the new methodology. We find it totally indefensible that this report was edited and manipulated to support the final recommendation decision. A review of internal DOE documents strongly suggests that DOE had decided on the three sites prior to completion of the methodology report, and then tailored the methodology report to justify the final decision. This contention is further supported by the fact that both the methodology and the recommedation reports were edited at the same time, by the same individuals at DOE. Thus, the methodology report which DOE claimed was "decision-aiding" turned out to be quite the opposite. It was in fact "decision-aided" since DOE was altering this report to support the final recommendation decision.

Specifically, DOE suppressed information which clearly established the undesirability of the Hanford, Washington site and

the relative desirability of the Richton Dome, Mississippi site over the Deaf Smith County, Texas site. For instance, early drafts of chapter five of the methodology document concluded that the Hanford site should not be chosen for site characterization:

> "[I]t can be definitively stated that the results of the composite analysis strongly suggest characterization of the Yucca Mountain, Richton Dome, and Deaf Smith sites....There are no realistic assumptions about either preclosure or postclosure expected performance or about the value used to evaluate performance that can result in Hanford being anything but the last ranked site." (emphasis added.)

This passage was deleted in the final version.

Furthermore, statements from this chapter which supported the choice of the Richton Dome, Mississippi site over the Deaf Smith County, Texas site were also deleted from the final analysis:

> "For all assumptions about postclosure conditions and [a] wide range assumed to be realistic for weights...the relative ranking of the salt sites is stable; namely Richton Dome is preferred to Deaf Smith which is preferred to Davis Canyon."

But DOE did not stop at deleting just unfavorable phrases and passages from this final document. Unbelievably, in one case, an entire chapter disappeared. Drafts of this deleted chapter were discovered in DOE's files. Entitled "Other Information," or "Other Considerations," this chapter evaluated additional factors outside the scope of the multiattribute utility analysis which were "relevant to the site recommendation decision." One part of the chapter identified disqualifying conditions for each of the sites where "there is a reasonable likelihood that extremely poor site conditions could result in a small, but significant, probability of disqualification...." of a site. The DOE reached the following conclusion concerning this analysis:

> "Based on this review of disqualifying conditions, the Davis Canyon site and the Hanford site appear to be the least favorable sites. The Deaf Smith County site and the Richton Dome sites appear to be the most favorable sites; and the Yucca Mountain site should fall between these two groupings."

The recommendation report also went through many drafts and iterations. An examination of such drafts indicate that critical passages and phrases were also deleted from this document. For example the following passages were deleted from the final version of the recommendation report:

> "The initial order of preference, from the most-preferred to least preferred, is the Yucca Mountain site, the Richton Dome site, the Deaf Smith County site, the Davis Canyon site, and the Hanford site. Sensitivity analyses show that this initial order of preferenece is unchanged for a wide range of weights or scaling factors relating postclosure and preclosure impacts."

> "The results of sensitivity analyses strongly suggest that sites with lower expected postclosure utilities also tend to have greater uncertainties in postclosure performance. This range of uncertainty indicates little opportunity for the sites to improve, based on the results of site characterization studies, beyond the best-estimate values. However, <u>there is considerable opportunity, especially for the non-salt sites, to retrogress</u>, based on the results of site characterization studies, below the best-estimate values." (emphasis added.)

In addition to the deletion of unfavorable passages in both the methodology and recommendation reports, DOE manipulated its site selection analysis in order to place Hanford among the top three sites and to choose the Deaf Smith County site over the Richton Dome site. DOE accomplished this task by taking several highly questionable steps. These steps are detailed in the attached staff memorandum.

In the final analysis, DOE based its decision to select the Hanford site on rock diversity considerations. Since only three rock types were under consideration to begin with, the application of this final criteria guaranteed that the only basalt site, Hanford, and the only tuff site, Yucca Mountain, would be chosen. The only task remaining was to choose among the salt sites.

Since the rock type diversity criteria was so important, it should have been included in the methodology, so it could have been considered and weighted along with the other factors. It is apparent that rock type diversity could very well have been included in the methodology, but DOE refused to allow the eight weeks necessary to include it in the formal multiattribute utility analysis. It is simply incomprehensible that one of the most important factors, in effect the one overriding factor which made the final decision for DOE, was deliberately left out of the analysis.

The Subcommittees' analysis of the flawed nature of the DOE decision process is further supported by comments from the scientific community. A decision analyst, Detlof von Winterfeldt, who participated in the National Academy of Sciences review of the

DOE's application of the multiattribute utility analysis criticized the DOE's use of the results of such analysis to reach the selection of the final three sites. Professor von Winterfeldt expressed his objections in a letter to the Director of the DOE's nuclear waste program on July 22, 1986:

> "In brief, I believe that the conclusions drawn in the Recommendation Report are based on selective and misleading use of the analysis described in the Methodology Report....I find a convincing analysis that clearly rejects the Hanford site and, furthermore, supports the selection of the Richton Dome site over the Deaf Smith site....The most important conclusion that I draw from the Recommendation Report's inclusion of the Hanford and Deaf Smith sites is that DOE is apparently willing to accept more health effects and an additional cost of $3.360 Billion in return for several minor advantages of the two sites. As a decision analyst, I find these implications inconsistent with the Methodology Report. As a concerned member of the public and a taxpayer, I find them irresponsible."

In conclusion, we believe it is painfully evident that DOE's recommendation decision is seriously flawed and totally insupportable. Given the tremendous loss of credibility the waste program has suffered in the last several months, given the vote of no-confidence which this program received in the continuing resolution passed by Congress this past week, given the findings of this investigation, we request that you address the issues and failings cited in this letter and present a detailed plan to our Subcommittees in the next thirty days which establishes actions to restore the credibility of the waste program. In particular, such a plan should include a schedule for reevaluating the five sites according to a thorough and complete application of the multiattribute utility analysis.

Sincerely,

Ed Markey
Edward J. Markey
Member of Congress

Jim Weaver
James Weaver
Member of Congress

Al Swift
Member of Congress

Ron Wyden
Ron Wyden
Member of Congress