



July 2, 1984

## POLICY ISSUE

SECY-84-270

(NEGATIVE CONSENT)

For: The Commissioners

From: William J. Dircks  
Executive Director for Operations

Subject: COMMENTS ON THE DEPARTMENT OF ENERGY'S  
DRAFT MISSION PLAN FOR THE CIVILIAN  
RADIOACTIVE WASTE MANAGEMENT PROGRAM

Purpose: To request the Commission to review the comments  
on the draft Mission Plan for the Civilian Radioactive  
Waste Management Program which the Director, on behalf of  
the Commission, intends to send to DOE.

Discussion: The Department of Energy submitted the draft Mission Plan  
to the NRC on May 8, 1984, requesting comments by July 9,  
1984. The Mission Plan is required by Section 301 of the  
Nuclear Waste Policy Act of 1982 (NWSA). Copies have been  
forwarded to each of the Commissioners. The draft includes  
a revised version of Volume I, based in part on NRC's  
comments on the preliminary draft of Volume I reviewed  
earlier this year, and Volume II, which covers information  
specifically required under NWSA. The Department of Energy  
briefed the Commission on the draft Mission Plan on  
June 27, 1984.

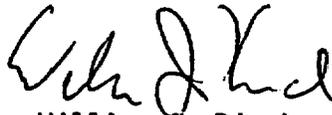
Enclosed is a proposed letter to DOE transmitting comments,  
which have been coordinated by NMSS. Enclosure 1 of the  
letter provides comments in the form of "objections," as  
specified under NWSA. DOE must satisfy these objections by  
revising the Mission Plan, or must publish a notice in the  
Federal Register giving reasons for not so revising it.  
Enclosure 2 of the letter contains other comments, which  
DOE may incorporate as they consider appropriate.

Contact:  
Neil Numark, NMSS  
427-4328

On June 22, 1984 the Commission met and concurred on the DOE repository siting guidelines. In that meeting Mr. Rusche agreed that the preliminary determination required by NWPA Section 114(f) would be made following site characterization; our comments on the draft Mission Plan reflect that agreement. It should be noted that if this requires DOE to undertake the characterization of more than three sites in order to ensure that three sites are suitable for development as repositories pursuant to Section 114(f), this scenario is not reflected in the draft Mission Plan, nor has it been included in our staff's plans or budget.

Recommendation:

Note that the staff intends to forward the enclosed letter and comments to the Department of Energy within ten working days of the date of this paper unless otherwise instructed by the Commission.



William J. Dircks  
Executive Director for Operations

Enclosure:  
As Stated

SECY NOTE: In the absence of instructions to the contrary, SECY will notify the staff on Thursday, July 19, 1984 that the Commission, by negative consent, assents to the action proposed in this paper.

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ENCLOSURE 1NRC OBJECTIONS TO THE DRAFT MISSION PLAN

Section 301(b)(2) of NWPA directs that "In preparing comments on the mission plan, [the NRC] shall specify with precision any objections that they may have." Upon receipt of these comments, the Secretary is required to publish a notice in the Federal Register regarding their receipt and availability for public inspection. If DOE does not then revise the Mission Plan to meet objections specified in such comments, DOE must "...publish in the Federal Register a detailed statement for not so revising the mission plan." Our objections under Section 301(b)(2) are contained in this enclosure.

The criteria used to determine whether a comment should be identified as an objection were formulated on the basis of the Commission's responsibilities under the Atomic Energy Act, the National Environmental Policy Act, the Energy Reorganization Act, and the Nuclear Waste Policy Act, and on the basis of the Commission's ability to reach a sound licensing decision in a timely manner. Accordingly, objections were identified by applying the following criteria to the topics commented on:

- o Differences between DOE's plans and what is required under the Commission's statutory responsibilities, including Commission regulations;
- o Differences between DOE's plans and what is required under the Nuclear Waste Policy Act or other pertinent statutes, that we believe would have a direct and significant impact on the Commission's licensing responsibilities
- o Differences between NRC and DOE estimates of the lead-times necessary to meet regulatory requirements;
- o Concerns that necessary information will not be available to support regulatory decisions, especially for licensing decisions, but also for planning of the regulatory research program.

GENERAL OBJECTIONSOBJECTION #1

There is a need for the Mission Plan to demonstrate that all aspects of the geologic repository program and other activities that might be referenced in licensing are covered by an acceptable quality assurance program. It is important to include early NRC involvement in the quality assurance development.

NRC staff comments provided to DOE in February noted that the preliminary draft of the Mission Plan did not address a quality assurance program for either DOE's internal needs or the requirements in support of the adjudicatory hearings at the time of license application or waste emplacement. We remain concerned that unless the necessary QA is demonstrably factored into the program plans early, the necessary pedigree will not be available to support regulatory decisions.

The Mission Plan discussion of quality assurance states (p.3-A-19) that the description of the QA program for design will not be furnished until the license application. Because design activities, including performance assessment and computer modeling, will be performed during the site characterization phase, it is important that a description of the overall QA program, including that for design, be provided well before licensing. Not obtaining early resolution of quality assurance program issues that would arise under Subpart G of 10 CFR Part 60 risks repeating problems associated with reactor licensing; i.e., developing information for licensing without sufficient assurance that it will be acceptable for use in licensing. In addition to information on the application of QA programs to data collection, which 10 CFR §60.11 requires be provided in the Site Characterization Plans, we believe the application of QA to the related programs of design development also needs to be addressed. The Mission Plan should identify specifically where this information will be provided if not in the Site Characterization Plan.

Regarding application of the QA program to site characterization activities, DOE states that QA to be applied to data collection will be described in the SCP. The scope of the QA program for the Waste Management Program needs to encompass all activities and issues which may be referenced in licensing. Historical site characterization data, for example, which have already been collected will have to be qualified and demonstrated to be of adequate quality for their intended use.

The NRC staff recently published a major study for Congress of quality-related problems in nuclear power plants. The results are published in a report entitled "Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants," (NUREG-1055). This information may be useful to DOE in developing and implementing a QA program. This report will be forwarded to the DOE under separate cover.

#### OBJECTION #2

The repository design process described in the Mission Plan does not provide assurance that an adequate level of information will be available to support each stage of the repository development and licensing process.

In our February 8, 1984 comments on the preliminary draft of the Mission Plan, we noted that the sequence for developing repository design information did not appear to be consistent with what will be needed to make findings under 10 CFR Part 60. Although some language has been changed, there is still some ambiguity on this point.

Sufficient repository design information is needed to demonstrate compliance with 10 CFR Part 60 performance objectives and requirements at the time of submittal of a license application. See in particular 10 CFR §60.21(c)(2) and (3) concerning design information which must be included in the safety analysis report, and 10 CFR §60.31(a) on the findings that must be made prior to construction authorization. The Mission Plan (3-A-22) states that a repository construction authorization application will be submitted to NRC "based on Title I design of the repository and on the preliminary (Title I) waste package design." Title I is equated with a "preliminary" level of design information both here and in Vol. II (2-26). Furthermore, the Mission Plan states that "[t]he repository design (Title II) will be finalized during the Nuclear Regulatory Commission's review of the construction authorization application" (3-A-23). Title I/Title II design information may or may not be sufficient for licensing purposes; however, based on the discussion presented in the draft Mission Plan, NRC is not in a position to conclude that the content of Title I/Title II would satisfy 10 CFR Part 60 requirements.

We recognize that even after the license application is submitted, refinements on design in some areas will continue to be developed. However, all design information that is necessary to make findings on compliance with 10 CFR Part 60 performance objectives and requirements

must be provided at the time of submittal of a license application. We note that the Congressionally-mandated evaluation by NRC of recent reactor construction and licensing experience ("Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants," NUREG-1055) points to incomplete design at the construction permit stage as an important root cause of the serious problems and delays which have been encountered. We are concerned that use of "preliminary designs" of the repository and waste package for licensing reviews would result in similar problems.

The Mission Plan should state that sufficient design information will be provided in the license application to make the full set of findings required by 10 CFR §60.31 as stated in our February comments, so that the necessary information will be available to support licensing decisions. As indicated in the meeting among NRC and DOE staff on the preliminary draft of the Mission Plan on April 11, 1984, given the complexity of repository facilities, resolution of exactly what types, amounts, and levels of detail on design are required at each stage must be worked out through consideration of each aspect of design. As in the past, the NRC staff stands ready to consult with DOE staff through the various available prelicensing consultation mechanisms to address and resolve this matter.

We also recommend that at the earliest possible time during site characterization and design development, DOE implement a configuration control program, which as a minimum meets the requirements in Appendix B, 10 CFR Part 50, to assure that designs are approved prior to issuance and changes to design are systematically controlled.

### OBJECTION #3

The Mission Plan should specifically recognize the necessity of including a conceptual design in the SCP that meets the requirements of the NWPA and 10 CFR Part 60.

10 CFR Part §60.11(a)(6)(ii) and NWPA (Section 113(b)(1)(c)) require that a conceptual design be developed before site characterization so that data gathering plans relative to design may be included in the SCP. However, the Mission Plan (Vol. I, 3-A-16) states that "[t]hese site-specific conceptual designs will be completed in the 1985-86 time frame to support the site characterization plans." Inasmuch as the reference schedule for the first repository (3-A-38) shows the last SCP being issued by 9/85 and repository conceptual design studies continuing until 1/87, it is not clear whether or not a conceptual design of sufficient scope and level of detail will be completed as required by NWPA and 10 CFR Part 60.

It is recognized that conceptual design may evolve as data are gathered at each site. Also, some of the logic diagrams (e.g., Fig. 2-1) show that conceptual design information will be available for the SCP's. However, given the importance of having complete information, the Mission Plan should specifically recognize requirements of the NWPA and 10 CFR Part 60. It should recognize that a conceptual design must be included in the SCP with scope and level of detail sufficient to permit determining whether or not (a) the quantity and type of tests and analyses to be performed during site characterization will be adequate and (b) suitability of the site will be compromised by the components of the system that will be constructed for site characterization and later used in repository operation (e.g., exploratory shafts and test facilities).

#### OBJECTION #4

The Mission Plan does not identify how the performance goals for the various repository system components will be identified and controlled to ensure that necessary information will be available to meet the DOE schedule for submittal of a license application.

NRC staff has previously identified to DOE the need to establish, as soon as possible, the intended performance goals for repository system components on a site specific basis. This was also noted in NRC comments on the preliminary draft of the Mission Plan. 10 CFR §60.113(b) gives DOE flexibility, on a case-by-case basis, to propose tradeoffs among system components (natural and engineered). At least tentative identification of component performance goals by DOE is a necessary prerequisite to establishing what is a necessary and sufficient level of testing during site characterization and engineered component design phases. This could have a major impact on the DOE schedule. For example, whether site characterization can be completed within the 49 months assumed in the reference schedule (Case 2-B) or the 133 months described in alternate scenarios (Case 2-D) depends primarily upon how these performance goals are established and what is needed in terms of testing to demonstrate that these performance goals are being met (see, for example, Enclosure 2, Comment #3).

In both volumes (Volume I, page 3-A-15; Volume II, pages 2-38 and 2-39) the Mission Plan generally addresses this matter. In Volume II, Section 2.6, the systems engineering and performance assessment components of the DOE technology development activity are described. The description of the systems engineering task (2.6.1) states that top-level program documents on the mined geologic disposal system (MGDS) will be prepared for use in controlling technical requirements and in assuring uniformity of design

efforts. Generic MGDS documents are to be issued in FY84 and site specific MGDS documents will be issued during FY84 and 85. The description of these documents suggests that they will be used to determine "whether the individual parts of the system will successfully work together" and to assure the system is optimized in terms of "technical and cost performance." These are necessary goals. However, the discussion of these documents does not indicate that specific performance goals for each repository system component will be established for the purpose of establishing test needs, in Site Characterization Plans or other DOE program documents referenced therein.

The performance assessment task description indicates that preliminary assessments of site performance will be performed to determine what the subsystem performance objectives will be (Figure 2-6), and that the preliminary assessments will be used to evaluate data needs (Section 2.6.2). On its face, this appears to be logical. Early and ongoing performance assessment is needed to help identify data needs as indicated in the Mission Plan. However, we believe that assessments of site performance at the present stage of the repository program are likely to be premature for this purpose, given the uncertainties that exist before site characterization.

Hence, we believe it would be prudent to make an early technical management decision guided by the performance criteria of 10 CFR Part 60 as to what the performance goals for individual components should be, and how much redundancy among system components will be included. As indicated previously, the earlier these goals are set the better, because of the long lead times involved in repository design, development, and testing. Failure to do so could preclude the collection of necessary information in time for licensing and delay the program, as well as hinder NRC's ability to give timely guidance to DOE on licensing needs. Until at least tentative decisions have been made about intended component performance goals by DOE, the repository investigation programs may be misdirected. As discussed in Enclosure 2, Comment #3, the practical consequence of not having such goals is to preclude resolution of uncertainties in the duration of in-situ testing.

The initial setting of component performance goals must, of course, be tentative. An appropriate level of conservatism and redundancy among system components must be incorporated into the initial set of requirements owing to the uncertainties existing before site characterization. As site characterization proceeds, however, and uncertainties are reduced, it may be possible to relax some initial component requirements if site features can be demonstrated through actual

testing to support these performance assessments. Based on ongoing, quality-assured data collection and site-specific testing, performance assessment should be used to refine the initial component performance goals as well as to evaluate additional data needs and design requirements as stated in Section 2.6.2. However, until initial requirements are set, major questions about the necessary scope of DOE programs and schedules cannot be answered.

DOE must take the lead on this because deciding on initial performance targets will require consideration of many internal DOE budgetary, programmatic, and scheduling factors in addition to the overall performance objectives of 10 CFR Part 60. The NRC staff, however, stands ready to consult with DOE as these performance targets are established to help assure that ultimate licensing information needs are met.

#### OBJECTION #5

The Mission Plan should be revised to reflect the recent agreement between DOE and the Commission on the timing of the preliminary determination under Section 114(f) of NWPA.

At the June 22, 1984 Commission meeting on the Commission's concurrence decision on the DOE siting guidelines, the Commission and DOE agreed that the preliminary decision required by Section 114(f) of the NWPA should be made after the completion of site characterization and not at the time of site recommendation for characterization. The Mission Plan should be revised accordingly to reflect this agreement.

#### OBJECTION #6

The Mission Plan should provide additional information to justify the large diameter of the second exploratory shaft.

Pages 3-A-20 and 3-A-21 of the Draft Mission Plan contain a discussion of DOE's intent to "sink two exploratory shafts at each candidate site where they are required." The second shaft will be sunk to support safe operation of the underground testing program and will have a larger diameter than the first shaft. This larger diameter shaft will be approximately the same diameter as that indicated in the conceptual designs for repository access shafts (V. II, 7-15). The primary objective of the larger diameter shaft would be to "... provide flexibility in the scope and duration of in-situ testing" and to provide "... a demonstration of the ability to sink shafts of a size comparable to that needed for a repository." (3-A-21). DOE also notes that "... a large shaft could be

utilized to facilitate subsurface construction if that site were selected as the repository site."

The Commission's regulations prohibit commencement of construction of the repository until a construction authorization has been issued. 10 CFR § 60.3(b). Under the definition of "commencement of construction" in 10 CFR Part 60, DOE would be permitted to pursue activities related to site characterization and other preconstruction monitoring and investigation necessary to establish background information related to the suitability of the site. However, any construction that occurs during site characterization must be reasonably and functionally related to the objectives of site characterization. The Mission Plan should spell out the advantages of a larger diameter second shaft in terms of this criterion, including what additional site characterization data could be obtained.

To enable the Commission to review the justification of the larger second shaft during site characterization, the following information should also be provided: 1) the costs of site characterization activities with two large diameter shafts at each site compared with having a smaller second ventilation shaft; 2) the effect of the large diameter second shaft on site integrity and the ability to seal the repository; 3) the effect of the larger shafts on environmental mitigation concerns for sites which do not become repositories; and 4) the anticipated effect of constructing two large shafts during site characterization on subsequent repository construction schedules.

The rationale for the large diameter second shaft may well meet the criterion of being related to the objectives of site characterization. However, we must stress the limited extent to which construction may take place prior to the issuance of a construction authorization under our current rules.

#### OBJECTION #7

The Mission Plan does not provide sufficient discussion of the information necessary to permit decisions to be made concerning the primary scientific, engineering, and technical information needed, including systems integration, to support a license application. The Mission Plan should explicitly recognize this and state where and when such information will be provided.

In response to Sections 301(a)(1) and (2) of the NWPA, the Mission Plan identifies in a general way technical issues and information needs, and

summarizes the plans and schedules for research and technical development programs which are intended to satisfy these needs. The discussion is not complete enough, however, to determine whether information necessary to support licensing review and findings will be available by licensing time. Chapters 1 and 2 of Volume II which are intended to address these sections of the Act constitute only a summary of information needs and plans and should indicate where and when required additional information will be provided (e.g., in the EA's or SCP's).

Presumably, for those programs to be carried out during site characterization, needed information will be contained in the Site Characterization Plans (SCP's) or in planning documents provided in connection with it (in a manner described in NUREG-0960 pp. xx,xxi, 10-1 and 10-2). For investigations currently under way or due to be completed prior to submission of the SCP's, consultation on test plans before actual testing is necessary if unnecessary delays in programs are to be avoided. The principle of "prior consultation" is established in the NRC/DOE Procedural Agreement on Repository Site Investigations which also establishes the mechanisms for carrying out such consultation.

Given the requirements of NWPA Section 301(a)(1) and (2), which appear to call for more information than is presented, the limitations of the Mission Plan in this area should clearly be stated and the Plan should specify where and when this information will be provided.

Specific Objections

## ° Page 1-1, second paragraph

It is stated that the NWPA requires DOE to "...site, license, and operate repositories..." (emphasis added). In addition, on the same page, DOE states as a program objective, "... to site, license, construct... geologic repositories..." (emphasis added). These statements require revisions to eliminate any implication that DOE has licensing authority for the repository. We note, however, that DOE has primary responsibility for obtaining a repository license, which entails providing the information required for a license application under 10 CFR §60.21, and in general providing all information necessary to support a license application and carrying the burden of proof in the licensing proceeding. We suggest using the phrase "obtain a license for" in the appropriate places.

## ° Page 2-3, second paragraph

On page 2-3, the Mission Plan states that "[a]ny defense wastes disposed of in a commercial repository will be required to meet standards necessary to be compatible with licensing of the repository by the Nuclear Regulatory Commission." This statement incorrectly suggests that something less than formal NRC licensing of defense waste disposal at commercial repositories would be permissible. The Plan should clearly state that a commercial repository licensed by the NRC could only accept defense high-level waste if such waste met the license specifications of 10 CFR Part 60.

Furthermore, if a decision is made by the President to develop a repository exclusively for the disposal of high-level waste from atomic energy defense activities, this repository shall "(A) be subject to licensing under section 202 of the Energy Reorganization Act of 1974 (42 U.S.C. 5842); and (B) comply with all requirements of the [Nuclear Regulatory] Commission for the siting, development, construction, and operation of a repository." (Nuclear Waste Policy Act, Section 8(b)(3).)

## ° Page 3-A-16, last paragraph-

Release rate requirements are on the engineered barrier system, not exclusively on the waste package.

o Page 3-A-19, Section III.A.6.a

In describing the QA program for the license application, the terms "safety-related structures, systems, and components" are utilized. This is inconsistent with the terms are in Subpart G of 10 CFR Part 60 which are "systems, structures, and components important to safety" and "barriers important to waste isolation."

Also, a distinction is made in the Mission Plan between the QA program description for design and that for site characterization (for the former, the adjective "detailed" is utilized). A description of the program as it applies to all areas should be furnished in the Site Characterization Plan. Both of these items should be revised in the final Mission Plan.

o Page 3-A-23, first complete paragraph

It is stated that the repository design will be finalized during the Commission's review of the "construction authorization application" and that the "application for the license to receive and possess radioactive waste ... will be submitted to the Nuclear Regulatory Commission while construction is proceeding." These statements indicate that DOE may not completely understand the nature of the Commission's licensing process. As we pointed out in our comments on the preliminary draft of the Mission Plan on the use of the term "construction authorization application," the process established by 10 CFR Part 60 involves an application for a license to receive or possess source, special nuclear, or byproduct material at a geologic repository operations area. 10 CFR § 60.3(a). As an initial step in its review of the license application, the Commission may issue a construction authorization for the repository if the requisite standards are met. 10 CFR § 60.31. Under 10 CFR § 60.32(d), DOE is required to update its original license application as specified in 10 CFR § 60.24 before the Commission will issue a license to receive radioactive waste at the repository. Although we have no objection to the use of the term "construction authorization application" as a convenient way to describe that portion of the repository siting process (particularly in view of the fact that this term appears in several sections of the NWPA), the use of this terminology should be within a context that clearly and accurately describes the Commission's licensing process.

o Page 3-A-23, second complete paragraph

DOE states the repository will be designed to allow waste retrieval up to 50 years after initiating waste emplacement operations. This is different from the Commission's requirements on retrievability in 10 CFR §60.111(b).

This provision requires repository design "... so that any or all of the emplaced waste could be retrieved on a reasonable schedule starting at any time up to 50 years after waste emplacement operations are initiated..." (emphasis added).

o Page 3-A-32, Case 2-A

Under this alternative, in-situ test data would not be available to support the site selection decision. DOE should note in the Mission Plan that under 10 CFR §60.10(b), it would have to obtain Commission approval in order to exclude in-situ exploration and testing from the site characterization programs.

o Page 3-A-43, Alternative Schedule 4

In our comments on the preliminary draft of the Mission Plan, we indicated that the Commission regulations do not provide for a limited work authorization for a geologic repository; the Commission does not consider it appropriate to proceed without a comprehensive review of the license application for such a first-of-a-kind facility. The draft Mission Plan includes alternative schedule 4 (3-A-43; Figure A-4) which is based upon DOE's coming to NRC with a "construction authorization application" for the work handling facilities on the surface 18 months prior to site description and the "CAA" for the full underground repository. The NRC would therefore be asked to approve construction of the surface facilities prior to the decision on suitability of the site for a repository. This means that a massive monetary commitment would be made to the as-yet-unapproved site for activities that would provide no additional data relating to site suitability. Furthermore, such a premature commitment of funds could be perceived as biasing NRC's review of the site's suitability.

Should the NRC be asked to consider the two-step approach, it is clear that 10 CFR Part 60 would have to be modified to allow for a lesser determination of suitability inasmuch as when the first CAA is submitted, all the information needed to establish the site suitability against the performance objectives of 10 CFR Part 60 would not be available. Both legal and policy concerns could present obstacles to this course.

o Page 3-C-8, first full sentence

It is stated that "a" major activity for the Department would be to work with the Nuclear Regulatory Commission (in accordance with 10 CFR Part 71) to develop and maintain technical data bases and to establish a consistent

set of certification criteria for use in evaluation and acceptance of the system." The statement should be revised to eliminate any possible implication that the Department will develop certification criteria for the NRC to use in accepting the Department's system.

- Page 3-D-1

DOE describes the NWPA's provisions on the Federal Interim Storage Program. The statement on the Commission's responsibilities should be revised to clearly express the criteria contained in Section 135(b) of the NWPA.

- Vol. II, page 1-5, Issue 1.1

It is not an accurate paraphrasing of 60.113(a)(1)(ii) to say that "For the site to be compatible with waste containment, it must be possible to design and build a waste package that will survive intact in the geohydrologic setting for the duration of the containment period (300 to 1000 years)." 10 CFR §60.113(a)(1)(ii)(A) requires that the containment be "substantially complete." Furthermore, the post-containment performance objective of 10 CFR §60.113(1)(ii)(B) needs to be addressed under Issue 1.1. A suitable revision would state, "For the site to be compatible with the achievement of waste containment and isolation objectives, it must be possible to design and build a waste package compatible with the requirements of 10 CFR §60.113(a)(1)(ii) on the engineered barrier system." For further clarification, the language of 10 CFR §60.113(a)(1)(ii) could be provided.

- Vol. II, Issue 1-3, page 1-7

There is an apparent contradiction between lines 3-5 of the issue statement and lines 4-6 of the first subsequent paragraph. The statement of the issue suggests that DOE intends to rely on the waste package alone to meet the release-rate requirement 60.113(a)(1)(ii)(B). On the other hand, the performance of the waste package is to contribute to controlled release in the subsequent paragraph. This underscores the importance of explicitly specifying the level of component performance.

In addition, "Issue 1.3..." refers to "performance objectives for waste packages beginning after "emplacement." According to 10 CFR 60.113(a)(1)(ii)(A) containment performance begins at "permanent closure" not "waste emplacement."

Such a misconception could affect waste package design, and the analysis of containment, release, and migration of radionuclides.

° Vol. II, Key Issue 2, page 1-13

The issues which address information needs with respect to operational safety do not include the need to determine the structures, systems and components that are important to safety 10 CFR §60.131(b). This discussion should be included.

° Vol. II, (Section 2.2.1.6 pages 2-11 and 12)

The term "natural resources" includes all types of resources including oil and gas, metallic and non-metallic minerals, and groundwater.

We believe the Mission Plan activities, as stated, would lead to an incomplete study of (1) the identification and evaluation of natural resources, especially of undiscovered resources, and (2) the possibility of their extraction as a potentially adverse condition. The specific requirements of 10 CFR §60.21 and 10 CFR §60.122 are as follows. There is no indication in the Mission Plan that the requirements underlined below will be investigated.

10 CFR §60.21(c)(13) requires:

"An identification and evaluation of the natural resources of the geologic setting, including estimates as to undiscovered deposits, the exploitation of which could affect the ability of the geologic repository to isolate radioactive wastes. Undiscovered deposits of resources characteristic of the area shall be estimated by reasonable inference based on geological and geophysical evidence. This evaluation of resources, including undiscovered deposits, shall be conducted for the site and for areas of similar size that are representative of and are within the geologic setting. For natural resources with current markets the resources shall be assessed, with estimates provided of both gross and net value. The estimate of net value shall take into account current development, extraction, and marketing costs. For natural resources without current markets, but which would be marketable given credible project changes in economic or technological factors, the resources shall be described by physical factors such as tonnage or other amount, grade, and quality."

The presence of natural resources is a potentially adverse condition under 10 CFR §60.122 if: "(i) Economic extraction is currently feasible or potentially feasible during the foreseeable future; or (ii) Such materials

have greater gross value or net value than the average for other areas of similar size that are representative of and located within the geologic setting." Potentially adverse conditions must be evaluated if they are characteristic of the controlled area or may affect isolation within the controlled area.

- ° Vol. II, page 3-14, fourth paragraph, last sentence

This sentence implies that NRC could change its regulatory requirements based on informal communications with DOE and without making formalized changes to 10 CFR Part 60. This is not the case. NRC cannot change its requirements without undertaking the proper rulemaking procedures.

ENCLOSURE 2NRC COMMENTS ON THE DRAFT MISSION PLAN

Section 301(b)(3) of NWPA applies to "any other comments," which may be used in revising the Mission Plan to the extent that DOE considers to be appropriate. Our comments under Section 301(b)(3) are contained in this enclosure. Although the issues addressed in these comments did not meet the criteria for "objections" as defined in Enclosure 1, many of them could potentially have greater consequences than the objections given in Enclosure 1. In some cases a lack of information concerns us, because the program plans which are not described could in fact be the basis for objections, and we wish to ensure that the planning strategy will be consistent with regulatory needs.

GENERAL COMMENTSCOMMENT #1

A two-stage construction approach as proposed under DOE's reference repository schedule would be allowed under the Commission's current regulations. However, the information contained in the Mission Plan on the anticipated sequence of events makes it difficult to fully assess the procedural implications of the plan and to determine how it would comply with NRC procedural requirements as they relate to construction and operation of the full-scale repository. Additional information on the two-stage construction plan is necessary.

DOE's reference repository schedule and plan is based on a two-stage construction process (3-A-41). The basic concept would involve a "Phase I" construction of the surface and shaft facilities necessary to allow acceptance of "small quantities" of spent fuel beginning in 1998 (3-A-36). "Phase II" would consist of the construction of the remaining facilities needed to develop the full scale repository, to be operational in 2001 (3-A-36, 3-A-41). The primary objective of this two phase approach is to provide "...a mechanism for initial acceptance of waste in January 1998." (3-A-41) The alternative of constructing the full scale repository with no limited phase of operation was rejected by DOE "because it did not meet the 1998 milestone in the Act." ( 3-A-41)

First, we believe the terminology used in the Mission Plan to describe the two-phase construction process is potentially confusing and should be changed. Normally, "Phase 1" and "Phase 2" of a project would suggest two

events proceeding in series, whereas the reference schedule would have both facilities constructed in parallel for the first 53 months.

The Commission's current regulations allow the granting of a license to operate a small scale facility while a larger facility has yet to be completed, as outlined in the reference schedule. <sup>1/</sup> 10 CFR Part 60 does not require that the license application include any specified repository size, or amount of waste. The licensing process established in 10 CFR Part 60 requires DOE (in advance of construction) to submit an application for a license to receive or possess source, special nuclear, or byproduct material at a geologic repository operations area. 10 CFR § 60.3. After submittal of the license application, the Commission may authorize construction of the repository if the requisite standards are met. 10 CFR § 60.31. DOE must subsequently update its license application to take into account data obtained during construction. 10 CFR § 60.24. Under 10 CFR § 60.41(a), the Commission may then issue the license if the construction of necessary structures and the "underground storage space required for initial operation" are substantially complete. Such initial operation could be limited to receipt and possession of small quantities of spent fuel.

However, the Mission Plan does not clearly spell out the anticipated sequence of events under the reference two-phase construction schedule in a manner which adequately demonstrates how the schedule will correspond and comply with this sequence of licensing events required by 10 CFR Part 60. Specifically, the text does not address whether one or two licensing proceedings are intended in order to authorize construction and operation of the two phases of the repository. The only indication given appears in Figure 3-A-5, which shows construction of both Phase 1 and Phase 2 beginning in August 1993 when the construction authorization is received from NRC. From this it is inferred that the license application would address the full facility. The planned licensing schedule should be provided in the text.

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1/ In a previous statement made in response to a Congressional inquiry on the advantages of constructing a small scale or pilot repository, the Commission indicated that 10 CFR Part 60 would allow for the licensing of such an approach. H. R. REP. NO. 1156, Part III, 96th Cong., 2d Sess. 41 (1980).

As we understand DOE's plans, a single application would be submitted to the Commission, including the designs for both phases of the repository. <sup>2/</sup> Once the construction authorization was obtained, the surface facilities for Phase 1 and Phase 2 would be constructed in parallel. The initial license would allow receipt for disposal of a limited quantity of waste at the Phase 1 facility by January 1998, and the license would later be amended to allow receipt of greater quantities of waste at the full-scale facility approximately three years later.

If this description of DOE's plans is correct, it should be provided in the text of the Mission Plan. We caution DOE in proposing any alternative for two-phase construction involving submission of two separate license applications, which could also be construed from the limited information provided in the draft Mission Plan. For example, DOE could file a license application for a first stage limited repository, receive a construction authorization for the limited repository, obtain a license to receive and possess a small quantity of spent fuel, and only then seek authorization to expand the facility. The proposed expansion would involve a license amendment, and the procedure to be followed is prescribed by 10 CFR §60.45. This course of action would be straightforward from a procedural standpoint, but the schedule implications might be unacceptable to DOE. The alternative is that DOE might request NRC, in the period between issuance of a construction authorization for the first stage repository and the issuance of license to receive and possess spent fuel there, to authorize construction of the full-scale repository. Such a request would be in the form of an application for amendment of construction authorization (10 CFR §60.33). The administrative situation would be confused and complex if DOE were to seek final authorization to receive and possess the small quantity of spent fuel contemplated by the original application while review of the amendment to the construction authorization was pending.

<sup>2/</sup> For clarification of DOE's intended licensing schedule, we rely on information provided to NRC in a public meeting on April 11, 1984 with William Bennett, Acting Associate Director, Office of Geologic Repository Deployment, USDOE, and other staff members in which it was indicated that the license application would be for both facilities. A May 21, 1984 letter from Mr. Bennett to Robert Browning, Director, Division of Waste Management, USNRC, confirms this information.

In addition, any scenarios involving less than an initial license application for the full facility<sup>3/</sup> would require consideration of whether the environmental impact statement for the repository would be limited to the first-phase project or apply to the full facility. CEQ regulations require that all proposals which are related to each other closely enough to be, in effect, a single course of action shall be evaluated in a single impact statement. 40 CFR § 1502.4(a). Moreover, several factors have been identified by the courts as bearing upon the appropriate scope for an EIS - among them, that the project described in the EIS should have "substantial independent utility" and that it should not irretrievably commit federal funds for closely related projects not considered in the EIS. See, e.g., Piedmont Heights Civic Club, Inc. v. Moreland, 637 F.2d 430, 439 (5th Cir. 1981). Limiting the EIS to the first stage may render DOE (and NRC) subject to challenge.

In addition to providing clarification of licensing intentions for the two-phase repository, the Mission Plan needs to specify what facilities would be constructed at what points in the schedule. The Mission Plan states (3-A-36) that surface and shaft facilities necessary to accept small quantities of spent fuel would be constructed in Phase 1, and the "remaining facilities" for the full-scale repository would be constructed under Phase 2. Yet Phase 1 and Phase 2 construction would begin simultaneously and proceed in parallel until the completion of Phase 1 construction (Fig. 3-A-5). It is not clear what will constitute the "remaining facilities." The Mission Plan should provide a breakdown of this 53 month period, listing all facilities, both surface and subsurface, which would be constructed during that time and stating whether these facilities are part of Phase 1, Phase 2, or both. This discussion should clarify the extent to which the Phase 1 and Phase 2 operations will utilize common facilities, such as whether the Phase 2 waste handling building will be an extension of the Phase 1 building utilizing the same waste emplacement shaft, or if a separate waste handling building will be constructed requiring a new large diameter shaft and possibly separate subsurface areas.

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3/ Note that the Commission has previously expressed its preference to review an application from DOE for the entire repository "in order to properly evaluate the geologic and hydrologic conditions at the site for any potential health and safety problems before issuing a license to emplace waste in all or part of the repository. H.R. Rep. No. 411, Part 1, 97th Cong., 1st Sess. 54(1981).

COMMENT #2

NRC recommends that the Mission Plan identify rulemaking as a mechanism for resolving certain potential licensing issues prior to the beginning of formal proceedings.

In the reference schedule, it is assumed that NRC licensing reviews will be complete in 3 years. Longer review times were rejected because, as described on page 3-A-41 NRC and DOE "can effectively use the semi-annual updates of site characterization plans to systematically identify and resolve potential licensing issues." We agree that the three year licensing schedule assumption is most appropriate because of the opportunity that is provided by NWPA and our regulations for prelicensing consultation between DOE and NRC staffs aimed at assuring DOE license application is complete and of demonstrably high quality. Given the first-of-a-kind nature of the geologic repository project, there is a large number of potential licensing issues which must be addressed.

Early DOE/NRC staff interactions which raise and address such issues are essential. However, given that licensing decisions will be made not by the staff but by an independent NRC hearing board, and reviewed by the full Commission, it must be made clear in the Mission Plan that staff resolution of potential issues will not prevent such issues from being challenged by participants in licensing hearings. The only way to formally resolve an issue prior to licensing proceedings is for the Commission to initiate and complete a rulemaking action. It is our judgment that rulemaking on selected important issues may prove to be necessary in order to avoid delays in licensing. Throughout the rulemaking process, interested parties are afforded full opportunity to participate in Commission decisions and such decisions are judicially reviewable.

Therefore, we recommend that the Mission Plan recognize the potential need for such rulemakings. We expect that through the existing interactions specific important issues that should be resolved before proceedings begin can be identified. While there is flexibility in 10 CFR Part 60 technical criteria and performance objectives to make tradeoffs among system components providing waste isolation, it should be recognized that the ability to "piecemeal" the licensing review in this manner may require that DOE make certain programmatic decisions before submitting a formal license application.

COMMENT #3

The Mission Plan recognizes (Vol.I, 3-A-33, Case 2-D) the uncertainty in the duration of in-situ testing which may be required to support licensing findings. However, we feel that the Mission Plan should recognize that resolution of this uncertainty depends mainly on establishment of repository system component performance requirements.

Responding to NRC's comments on the preliminary draft, the Mission Plan does reflect uncertainty in the duration of in-situ testing, but does not recognize that resolving this uncertainty depends largely on DOE making programmatic decisions. Until the nearfield component's importance to performance is determined, it will not be clear how much information concerning, for example, the thermal effects of waste emplacement on the host rock and groundwater will be required. Hence, although the allowance (indicated in Case 2-D) of as much as three years over and above the time allotted in the reference schedule (Case 2-B) for in-situ testing may be reasonable, it appears arbitrary without a rationale in terms of the performance requirement of the nearfield to support it. Resolution of this issue is largely dependent on DOE's establishing site-specific design performance goals as discussed in Enclosure 1, Objection #4. For example, design measures such as limiting the thermal loading on particular components can reduce or eliminate uncertainties regarding the required duration of testing. Another option would be to take little credit for the near-field host rock which would be the focus of any large-scale thermal testing. As correctly described in case 2-D, this would take a relatively long time to complete.

In addition, under Case 2-A (3-A-32), in-situ test data would not be available to support the site selection decision. DOE should note in the Mission Plan that 10 CFR §60.10(b) requires that site characterization include an in-situ exploration and testing program unless the Commission determines that it is not necessary.

COMMENT #4

The Mission Plan does not discuss responsibilities for non-radiological occupational health and safety programs.

We suggest that the responsibilities with regard to occupational health and safety be discussed in the Mission Plan. Through NWA, other statutes, and specific written agreements (i.e., consultation and cooperation agreements with States and affected Indian tribes, NWA Sec. 117(b)(c)) the roles, responsibilities and interfaces of and between

various governmental agencies (i.e., EPA and NRC) have been characterized with respect to most aspects of repository development and licensing. The Mission Plan summarizes, at least in a general way, what these responsibilities and interfaces are, principally with respect to radiological public health/safety and environmental protection. No discussion of responsibilities for occupational health and safety is presented, however. As with any mining operation, such as repository construction and operation, significant non-radiological occupational hazards exist and this is recognized in the Mission Plan statement of issues (Issue 4.6).

Since the Mission Plan does not discuss responsibilities for occupational health and safety, it could be inferred that the regulatory agencies involved with occupational health and safety in commercial operations (the Occupational Safety and Health Administration - OSHA, and the Mine Safety and Health Administration - MSHA) are not viewed as being involved in any aspects of the repository program. However, DOE also does not mention occupational health and safety in the discussion of its own responsibilities, but does address its role in other aspects of the repository program including program management, quality assurance, fund management and administrative services. We recommend DOE address the responsibilities and objectives of an occupational health and safety management program in the final draft of the Mission Plan.

#### COMMENT #5

The cost estimates for the geologic repository in the Mission Plan should reflect uncertainties that could affect cost and should provide a cost comparison of the reference construction plan (case 5-A) and the direct full-scale plan (case 5-B).

Chapter 10 of the DOE Mission Plan has provided a \$20 to \$23 billion (constant 1983 dollars) estimate of the total cost for the geologic repository. This chapter discusses some of the large uncertainties associated with an estimate of this type. However, the possible effect of inflation on the cost of this project over a three decade span is not evaluated, nor is there a contingency factor for unanticipated construction related problems. We suggest that the Mission Plan identify the major factors affecting cost about which there is substantial uncertainty, and estimate quantitatively what the potential impacts of these uncertainties are.

Furthermore, the Mission Plan's cost estimate does not appear to reflect the impact of the revised construction schedule presented in Volume I.

The draft states that the Phase 1 facility would be available to accept 400 MTU/year 53 months after the CA is granted, and the Phase 2 facility would accept 3000 MTU/year 90 months after the CA. In contrast, the Plan identifies an alternative schedule of proceeding directly with a full-scale facility, without limited phase-in, available 70 months after the CA is granted. In view of 1) the considerable excess time (20 months) to achieve full-scale operation under the phased-in approach, and 2) the NWSA (Sec.135(a)(1)) requirement that no more than 1900 MTU of Federal storage capacity be provided, a cost comparison of the reference construction plan (Case 5-A) and the direct full-scale plan (Case 5-B) would be extremely helpful.

Finally, the DOE cost accounting does not show the resources DOE currently expects to devote to such important safety-related activities as quality assurance, licensing proceedings (including hearings), safeguards, costs of Title I and Title II repository design, as well as Title III repository design verification and acceptance testing. These activities are integral parts of repository development and should be included in the Mission Plan cost estimates.

#### COMMENT #6

The Mission Plan needs to incorporate plans for probabilistic assessment into the DOE approach to developing a repository program.

The Systems Guideline of DOE's 10 CFR Part 960 cites EPA's high-level waste standard, which, in its present form, would require probabilistic assessment of the risk of radioactive materials release to the general environment. However, Vol. I and Vol. II do not address a probabilistic analysis of events, processes and conditions (both present and future) that would lead to releases of radionuclides to the accessible environment. [e.g., (1) Vol. I, 3-A-21, #4, line 2-3: "; reasonably credible disruptive event scenarios will be postulated and evaluated."; (2) Vol.2, 1-4, #2, bullet 3&4: " expected", "sufficiently credible"; (3) Vol.2, 1-6, #1, line 1-3: "Estimates of, and bounds on, the effects of natural phenomena that have reasonable potential for changing the present hydrologic flow system..., "etc.]

In its comments to EPA on proposed 40 CFR 191, the Commission has expressed reservations about the practicability of strictly using quantitative probabilistic assessments for licensing decisions due to the nature of uncertainties in the geologic systems. In Working Draft #4 of the EPA revisions to 40 CFR 191, EPA has inserted wording that recognizes that licensing decisions can be based on qualitative assessments, not just

formal quantitative probabilistic assessments of releases. In any case, it is likely that the final EPA standard (and therefore 10 CFR Part 60) will necessitate the use of probabilistic assessments of repository performance in the licensing process.

A probabilistic assessment of repository performance is a major technology-development task which is reflected neither in the "Repository-Program Approach" [Vol. I, 3-A-19 to 23] nor in the statements of "Information Needs" or "Plans for Obtaining the Information Needed to Site, Construct, and Operate a Repository" [Vol. II, chapters 1 and 2, particularly 2.6 -- "Systems"]. Based on our experience, the development of a methodology, including the development of an approach to determining probabilities for future events, processes and conditions, is a multi-year task. In addition to the internal technology-development task, this programmatic requirement has major potential impacts on institutional relations -- the development of confidence on the part of other affected parties that the specific DOE approach and methodology is adequate.

#### COMMENT #7

The Mission Plan would benefit from expanded discussion of defense waste management.

On transportation of defense waste, the Plan states only that "[t]he Department will ensure that transport systems for defense materials are compatible with repository receiving and handling facilities and are in compliance with Federal regulations," (3-C-6) with no indication provided as to when these systems will be developed or what they will entail. Under "Systems Integration," recognition is given to the fact that defense wastes may be disposed of in the repository (3-E-5), but plans for factoring such disposal into the program are not addressed, such as how plans for all-purpose or dual-purpose casks would be applied to defense waste management. Regarding solidification of defense high-level waste, the Mission Plan does not state how concerns for waste form compatibility with the repository are being addressed in current work on solidification, and the discussion of the solidification process (Vol. II, 8-3) does not recognize uncertainties in the performance of borosilicate glass. Although this information need not necessarily appear in the Mission Plan, it should be stated when and where it will be addressed. Specifically, it is not clear if such information would be provided in the SCP's or elsewhere due to its generic nature.

COMMENT #8

DOE should evaluate the effects of extended fuel burnup and include alternate spent fuel generation projections in the Mission Plan as well as an analysis of the effects of extended burnup on repository design.

The spent fuel acceptance schedule (p.2-2) does not consider the possible effect of improved fuel utilization on the rate of spent fuel generation. Therefore, the Mission Plan may be overestimating the size of future spent fuel inventories it will be obligated to accept for disposal. In addition, the effect of using higher burnup fuels on repository design is not addressed in the Draft Mission Plan.

In its comments on the General Accounting Office's report, "DOE Needs to Evaluate Fully the Waste Management Effects of Extending the Useful Life of Nuclear Fuel" (Report RCED-84-111), DOE stated that the results of studies on the effect of extended burnup on spent fuel discharge projections would be available by late summer 1984. Furthermore, the comments stated that the completion date of a study on the costs and benefits of extended burnup to the Civilian Radioactive Waste Management Program would be established by April 1984, although the results of the study would not be expected to be available before the end of FY84. Results from these studies or, at the least, a status report on the studies with discussion of how the results will be utilized, should be incorporated into a section on extended burnup in the final Mission Plan.

COMMENT #9

The Mission Plan would benefit from expanded discussion of the research, development and demonstration DOE must carry out in its development of a geologic disposal capability.

This comment is related to other NRC comments concerning the need for adequate information early on in order to make sound regulatory decisions and concerning NRC's intention to use rulemaking where appropriate to resolve potential licensing issues prior to the beginning of formal proceedings. In doing so NRC will be drawing upon results from its own regulatory research program. The utility of the NRC program will be greatly enhanced if it can reflect DOE's RD&D directions. NRC's more limited resources then can be better targeted to addressing the outstanding regulatory issues.

Specific Comments-Volume 1

Chapter 2

- ° Page 2-4, 1st paragraph, last sentence

All high-level waste in the repository will be retrievable, not just spent fuel.

- ° Pages 2-5, 2-8, and 2-9

The term "Federal at-reactor storage" is used on these pages in discussing a possible alternative to Monitored Retrievable Storage for acceptance of spent fuel in 1998 if the repository should be delayed. It is our understanding, as implied in the first paragraph of page 2-1, that the utilities would retain possession and control of the fuel even though DOE would provide Federally-owned storage casks for the additional storage capacity that might be required at some sites. It should be noted that, under present NRC requirements, the utility would require license authority under 10 CFR Part 72 for such storage because it would retain physical possession of the fuel and exercise safety and safeguards controls over the storage. The fact that title of the fuel might be assumed by DOE would not relieve the utility of its licensing responsibilities. On the basis of early experience and DOE demonstrations and research and development programs, it is expected before then that the NRC will have in place rulemaking to provide for generic approval of such storage without, to the extent practical, the need for site-specific approvals, as contemplated by Section 218(a) of the Act.

- ° Page 2-6, lines 5 to 7

DOE states that a public hearing process was conducted by NRC in connection with siting guideline concurrence. This is not quite accurate. The Commission held an informal public meeting soliciting comments on the guidelines. This was not a hearing process in the sense normally used in licensing proceedings.

Chapter 3-A

- Page 3-A-3, last paragraph, third sentence

We suggest that this sentence be revised to read, "After issuing the siting guidelines and obtaining NRC concurrence, the Secretary..."

- Page 3-A-5, fifth paragraph, second line

The use of the word "affected" could cause confusion with the term "affected Indian tribe", which does not appear to be intended here.

- Page 3-A-7, 4.d

The statement should mention that NRC's comments on the sufficiency of site characterization are required.

- Page 3-A-8, 4.i

The statement implies that Congressional approval for construction of the second repository follows receipt of construction authorization from the NRC. We suggest that it be revised to indicate that Congressional review will precede the license application as required by Section 114(b) of NWPA.

- Page 3-A-16, last sentence

Although there are brief references to retrievability in the sections on waste package (Volume I, 3-A-16, #3, lines 16-17; Volume II, 1-19, Issue 4.1 ), the discussions of the siting and repository design programs and Volume II, Chapter 1 (Information Needs) do not address the kinds of information needed to deal with the retrievability requirements.

The staff considers that the retrievability option should be addressed through an integrated site characterization program that includes geotechnical, rock-mechanics, and structural-design activities in addition to waste package studies. Performance assessment studies should be incorporated into the retrievability studies as a tool that can be used to integrate the earth science and engineering activities. This would help ensure that sufficient information on retrievability will be available in the license application to permit a regulatory decision.

° Page 3-A-20

This discussion of the development of final Siting Guidelines should be revised to include information on the interaction between DOE and NRC since November, 1983 when the proposed final Guidelines were submitted for concurrence, such as NRC's preliminary decision on concurrence, subsequent efforts to resolve contentious issues, and the Commission's June 22, 1984 decision to concur on the guidelines. Also, the Mission Plan should discuss how the Guidelines might be amended for compliance when EPA's final rules are issued, as required under the Commission's concurrence decision.

° Page 3-A-20, last paragraph

It should be mentioned that site characterization activities will follow the site characterization plan as well as site approval.

° Page 3-A-22, first complete paragraph

This paragraph first states that site characterization activities will be completed to determine, inter alia, site suitability based on 10 CFR Part 60. It then states that testing in support of the license application may continue at each candidate site. It is important for the Mission Plan to recognize that all testing needed for licensing decisions must be completed at the time of submittal of a license application. That testing must have brought DOE to such a point that additional investigations will provide only marginal returns in terms of reducing uncertainty about the performance of the repository. Such testing must clearly be "confirmatory" in nature as opposed to being required to support the "reasonable assurance" finding which must be made by the licensing hearing boards and the Commission. Therefore, this testing should be viewed as part of the performance confirmation program described in 10 CFR Part 60 Subpart F. The Mission Plan should reflect the more specific points and discussions on this matter which occurred in the meeting held between NRC and DOE staff on April 11, 1984 (See specifically pages 5-12 of the transcript of the meeting "Discussion of the OCRWM Mission Plan").

° Pages 3-A-22 to 23

The discussion of prelicensing interaction with NRC should explicitly identify the provision of information to NRC's Onsite Licensing Representatives.

- Page 3-A-24, third complete paragraph

The DOE plan to consider all three sites being characterized for the first repository as eligible for renomination for the second repository is acceptable provided at least three additional sites are nominated, as specified in Section 112(b)(1)(C) of NWPA.

- Page 3-A-40, first complete paragraph

This paragraph is not clear. It appears that DOE is allowing for 11 additional months of testing over Case 2-B, which has a duration of 49 months. This should be more clearly stated and is considered to be a more realistic estimate of the time needed for in situ testing.

- Page 3-A-40, last paragraph, second sentence

The sentence should be revised to read, "... the Nuclear Regulatory Commission then takes three years to issue the construction authorization findings."

- Page 3-A-41, first bullet

Revise: "The Nuclear Regulatory Commission issues construction authorization findings in August 1993."

- Page 3-A-41, first paragraph

In addition to the semi-annual updates of the site characterization plans, there are other forms of consultation and guidance for identifying and resolving potential licensing issues, such as documented technical meetings between NRC and DOE and NRC staff technical positions. The statement should be revised accordingly.

- Page 3-A-43, second and third paragraphs

In reference to the discussion of what is essentially a limited work authorization (LWA) concept, a more relevant precedent for the type of approach envisioned by DOE is 10 CFR §50.10 rather than Appendices N and O of 10 CFR Part 50.

In addition, although DOE does not recommend the use of an LWA for a geologic repository in this version of the Mission Plan, the discussion of its potential use indicates that it would involve a "construction authorization application" for the construction of surface waste handling

facilities for all three of the sites in March 1989, before the site designation by Congress under section 115 of the NWPA in August 1990. However, the NWPA would seem to prohibit any license application to the Commission before a site recommendation by the President and review by the Congress.

### Chapter 3-B

- Page 3-B-12, first paragraph

The Mission Plan estimates that the NRC licensing process for an MRS facility would require two and a half years. We consider the licensing process to include public hearings which, if they become extensive, could extend this process well beyond two and a half years.

### Chapter 3-C

- Page 3-C-2, first paragraph

Changes "assure maximum public safety" to "minimize risk to public safety." We do not believe regulations are intended to assure maximum safety.

- Page 3-C-2, second paragraph

Change "concerns about safety" to "concerns about safety and emergency response." This is suggested in recognition of State concerns about the adequacy of emergency response capability.

- Page 3-C-2, last paragraph

The statement, "The Department intends to contract with carriers that will comply fully with this regulation for its shipments under the Nuclear Waste Policy Act of 1982," does not explicitly define what the Department's role will be in the routing of nuclear waste shipments. We suggest this be included.

- Page 3-C-3, change the second sentence of second paragraph to read:

"The U.S. Department of Transportation (DOT) has set forth in 49 CFR 177 criteria it uses for determining whether or not state and local pre-notification rules are inconsistent with DOT hazardous material transportation regulations." We believe the emphasis should be on the

criteria specified to assure consistency rather than on any inconsistencies that may exist.

- Page 3-C-3, second paragraph, third sentence

Change "currently requires its licensees" to "is directed by Pub. L. 96-295 to require its licensees." This change explains that pre-notification is required by law and is beyond the scope of NRC rulemaking.

- Page 3-C-3, third paragraph, replace third and fourth sentences with:

Since 1969, the Nuclear Regulatory Commission (NRC) has had interim rules in effect for the protection of licensed spent fuel shipments. Currently, the NRC is considering whether the rules should be moderated, based on recently completed research which shows that the health consequences of successful sabotage of a spent fuel shipment would be small compared to the consequence estimates that prompted issuance of the interim rules. Also in progress is an NRC-sponsored study to determine what, if any, physical protection requirements should apply for shipments of radioactive waste, particularly shipments with dose rates comparable to those of spent fuel shipments. Currently, such high-level wastes are not being shipped and for that reason, no shipment protection requirements are presently in force. Requirements, if needed, will be developed and put into force before wastes are shipped to a nuclear waste repository. The Department will comply with whatever NRC shipment protection requirements are in force at the time that commercial spent fuel and commercial radioactive wastes are transported.

#### Chapter 3-D

- Page 3-D-3, last paragraph

The paragraph implies that the limited rod consolidation demonstration planned by TVA at its Browns Ferry Nuclear Station will require amendment of the reactor operating license. It is our understanding that the TVA plans have included an evaluation by TVA under the provisions of 10 CFR Part 50.59, and a determination that no amendment of the license is necessary.

Specific Comments-Volume IIChapter 1

## ◦ Page 1-3

The discussion in the first two paragraphs indicates that DOE anticipates that "many of the issues should not be especially difficult to resolve because the methods used to obtain the information and the analysis and interpretation of the information are straightforward and well established". As stated in the second paragraph, DOE considers "the preceding discussion on the relative difficulty of resolving issues applies to acquiring the technical data as well". Although this may be true in some specific areas, it is not necessarily "straightforward and well established" in others (e.g., unsaturated zone characterization in fractured rock). DOE should not overlook the impact that difficult technical studies could have on program schedules.

## ◦ Page 1-6, first paragraph

Groundwater flux should be included as an information need to plan the construction and operation of the repository and to design borehole and shaft seals.

## ◦ Page 1-6, Issue 1.1, Item 1.1.7

Additional events for consideration here might include the following:

- a) Climatic trends--Potential impact on the natural climatic cyclicity or variability resulting from anthropogenic inputs of CO<sub>2</sub>, O<sub>3</sub>, etc. into the atmosphere;
- b) Flooding--Potential damming resulting from sources other than climatic change alone such as tectonic and igneous activity and changes in water management practices; and
- c) Ground Water Flow--Changes in water management practices such as increased surface or groundwater withdrawal rates.

## ◦ Page 1-9, Issue 1.5

The influence of man on future climates (i.e., greenhouse effect) may need to be considered in a complete assessment of future climates. In addition, fossil pollen data analyses and evaluations would be very useful

in making the estimates needed to resolve this issue, especially items 1.5.1 and 1.5.2. Results could be described in item 1.5.7.

o Page 1-10

Discussion of Issue 1.6 concerning "rock dissolution" states that this is of "concern only to... sites in salt or other evaporite formations." The final sentence goes on to state that "even in...salt, dissolution... is not expected to affect the long term performance of the repository."

The discussion of dissolution appears to be directed solely at large-scale areal dissolution, rather than encompassing localized dissolution mechanisms, including dissolution along shafts or boreholes which would compromise sealing and produce short-circuits for radionuclide transport. The statement in lines 10-12 expresses more confidence in waste-isolation capabilities of salt than the staff believes can be justified on the basis of the models and data that are available today.

It appears from the discussions that DOE considers "rock dissolution" as a non-issue. DOE should document the reasons supporting their contention that dissolution need not be addressed as an issue.

o Page 1-11, Issue 1.7

The information needs do not address igneous activity. Failure of DOE to recognize the potential of igneous activity in media whose genesis resulted from such activity could result in delays later in the program. (Also Issue 4.5, page 1-21)

o Page 1-11, Paragraph 1.7.3

Add "...and focal mechanism solutions when available."

o Page 1-11, Issue 1.8

It is not possible to protect the repository from future human activities, but it is possible to site the repository such that the potential for intrusion is low. This issue should be reworded to reflect this consideration.

o Page 1-12

Has DOE considered the possibility that spent fuel...in addition to natural resources in place...should be considered as a material resource

that would motivate human intrusion? Under the definition of "unanticipated processes and events" in 10 CFR Part 60, intrusion to recover the residual energy resource value in spent fuel would have to be reviewed in the licensing process if the circumstances are sufficiently credible to warrant consideration. See 48 Fed. Reg. 28200, June 21, 1983.

° Page 1-15, Issue 2.2, Item 2.2.1

The phrase "coincident occurrence of atmospheric stability" should be substituted for the phrase "potential for inversion conditions," since the stability is what determines the atmosphere's ability to disperse effluents. An inversion is but one state of the stability spectrum. Topographic features should also be considered under this issue since they may affect population distribution and channel or obstruct air flows.

° Page 1-15, Issue 2.2, Item 2.2.5

Lightning and blowing dust and sand storm occurrences should be included in this item, as well as in Item 4.4.5 of Issue 4.5 on page 1-21. NUREG/CR-3759, "Lightning Strike Density for the Contiguous United States from Thunderstorm Duration Records," contains relevant information on lightning. Information on blowing dust and sand occurrences may be found in NUREG/CR-3211, "A Dust Climatology of the Western United States." The storms, which are usually accompanied by high winds and followed by thunderstorms, are relatively common in certain areas of the Southwestern United States.

° Page 1-20, Issue 4.2

Upstream water control structures such as dams should also be considered.

° Page 1-21, Issue 4.5, Item 4.5.5

Precipitation loads on structure roofs should be included with items considered in building design. Also, see comments under Issue 2.2, Item 2.2.5 on page 1-15 above.

## Chapter 2

NRC considers that a minimum requirement of DOE's license application is that DOE indicate that it understands the nature of the major phenomena which have a bearing upon the effective functioning of a HLW repository. Chapter 2 of Volume II leaves the possible impression that the research to be done in the DOE program is primarily data collection, without much attention being directed towards continuing to broaden the DOE's basic understanding of these phenomena. The Mission Plan should adequately reflect the ongoing DOE effort to gain that basic understanding through their identification of issues and subsequent testing program and field studies to resolve those issues.

- Page 2-1, paragraph 3, last sentence

Not all of the technical issues which DOE has to address are site specific.

- Page 2-2, last paragraph

Add...geomorphology

- Page 2-3, Section 2.2.1.1, first sentence

The models being discussed should be called conceptual models. Omit the item in parentheses.

- Pages 2-4 to 2-6, Figures 2-1 and 2-2

The logic diagrams do not appear to integrate systems/performance assessment in a consistent or logical fashion into the site characterization program. In Figure 2-1, "Integrated Logic Diagram for the First Repository," there is no indicated feedback from the site and regulatory program to the systems program, and the only indicated input from performance assessment to the repository and waste package program that seems to have a well integrated, iterative relationship with performance assessment is the exploratory shaft program. Figure 2.2, "Logic Diagram for Site Investigations," appears to be inconsistent with Fig. 2.1 in that Fig. 2.2 shows no performance assessment input to geology, geochemistry, hydrology, or environmental studies, which is shown in Fig. 2.1, but does show a feedback from each of these to performance assessment at the time of the SCP updates and the DEIS, which is not shown in Fig. 2.1. Similar inconsistencies exist with respect to repository and waste package programs. The exploratory shaft program logic does seem

to consistently incorporate performance assessment in an iterative fashion.

We recognize that in the text of the Mission Plan, performance assessment is identified as a tool for the "evaluation of additional data needs and design requirements" (Vol. II, p. 2-39) in connection with the site characterization plans; further, sensitivity and uncertainty analyses are called out as approaches for providing feedback to research programs and subsystem design groups (Vol. II, p. 2-40). In view of these invocations of performance assessment as a broad approach to site characterization and engineering-design activities, apparent inconsistencies in the logic diagrams of Volume II appear inadvertent and easily rectifiable.

- Page 2-8, Section 2.2.1.2, second paragraph

Are the measurements discussed field or laboratory measurements? Does DOE plan to collect thermodynamic data for various species of radionuclides? Does DOE plan to collect data for predominance diagrams (Eh-pH-plots)? Without supporting details or documentation, the NRC has no way of evaluating whether or not the level of detail at which issues are being addressed by the DOE HLW technical program will be sufficient for DOE to accomplish its mission.

- Page 2-9, paragraphs on tuff

What research does DOE plan to do to understand geochemical phenomena in unsaturated media, so that the right geochemical data will be collected.

- Page 2-10, Item 2.2.1.4

If sufficient samples can be obtained, fossil pollen investigations may prove useful at the salt site, as well as at the tuff site.

- Page 2-12, Section 2.2.2 - Hydrologic Studies

The section on Basalt indicates that specific plans, in document form, are being prepared for aquifer testing and monitoring and hydrochemistry. The sections on Salt and Tuff relate specific elements of what are presumed to be testing plans but give no indication of preparation and release of such comprehensive planning documents. One paragraph on page 2-15 serves as an example (for Tuff): "Chemical analyses and age dating of water samples will continue during site characterization drilling." This is fine but gives the impression of not having a well conceived hydrochemistry plan with specific objectives, planning elements, and data collection strategy

developed in consideration of the best conceptualization of the groundwater system available. The section is weak in showing that the DOE mission includes developing well documented plans.

- Pages 2-12, 13, and 14, paragraphs on Basalt

The Mission Plan should recognize that basalt is a fractured material describe what DOE plans to do to address outstanding research issues pertinent to flow and transport in saturated fractured media.

- Page 2-13, last sentence

Does DOE plan to do three dimensional cross-hole testing (discussed in NUREG/CR3213)?

- Page 2-14, paragraph on Salt

The "typical" Salt site description is more applicable to bedded than domal Salt. A more general description of domal salt would be ...a near-surface aquifer system---a vertical uplifting and piercing by salt flanked by a series of aquifers and aquitards...and a lower deep basin aquifer.

- Page 2-15, Paragraphs on Tuff

The Mission Plan should describe what DOE plans to do to address research issues pertinent to radionuclide migration in unsaturated media. Simple data collection will not compensate.

- Page 2-17, first paragraph, last sentence

"However, some of the information needed can be obtained only by gaining direct access to the target horizon and performance tests in and near an exploratory shaft."

This statement should also note that direct access to the rock along the entire length of shaft (between the surface and the target horizon) is also desirable.

- Page 2-20, Section 2.3.2 Construction

In the Shaft Construction schedules there appears to be an inconsistency: the duration of construction for Shaft in basalt is 18 months and for the

shallower shaft in Salt 19 months. The basalt shaft sinking should take longer than salt shaft sinking.

o Page 2-20, Section 2.3.2 Construction (ES)

Any site studies that are started before the SCP has been released and reviewed should have specific plans released in advance of the studies to allow for review and comment by NRC. This is consistent with the Procedural Agreement. An example of such an activity is the start of the engineering design borehole at the salt site in March 1985, six-months before the September 1985 issuance of the salt SCP.

o Page 2-21, Second set of bullets under Basalt

Are any geochemical tests planned? Does DOE plan to do any sampling of fracture distributions? Seismic velocities and response and other geophysical characterization tests are not bulleted.

o Page 2-21, Section 2.3.3., Testing

The "Site Suitability Testing Program of 8 months" does not appear to be long enough. The plan does include mention of in-situ measurements of thermomechanical response. These types of tests would take longer than eight (8) months.

o Page 2-21, Section 2.3.3, Testing (Salt)

The listing of salt site-suitability testing activities should include geologic mapping, drilling, or geophysics studies, which are important in confirming surface based studies and integrating with the testing results. Seismic velocities and response and other geophysical characterization tests are not bulleted.

o Page 2-22, Second set of bullets under Tuff

Are any geochemical tests planned? Does DOE plan to do any sampling of fracture distributions? Seismic velocities and response and other geophysical characterization tests are not bulleted.

o Page 2-26, Section 2.4.1, first paragraph

It should not be assumed that seismology and earthquake hazard are "pertinent environmental characteristics."

- Page 2-42, Paragraph on Tuff

How does DOE plan to represent unsaturated conditions in conjunction with the WAPPA code?

- Pages 2-42 and 43, Section 2.6.2.2 Last sentence of each of the last three paragraphs

Because of the long period of HLW isolation most computer programs used in HLW applications cannot be "validated" in the strict sense of the word. It is nonetheless important that testing during site characterization be thorough enough (and of long enough duration) to provide the greatest practical amount of information for code validation. "Accelerated testing" methods and studies aimed at determining or verifying descriptions of the physical principles involved should be emphasized as well as data measurements or "code calibration" tests. More information on what the NRC staff considers to be necessary for licensing is contained in NUREG-0960 and Regulatory Guide 4.17, Standard Format and Content Guide for Site Characterization Plans.

- Page 2-43, Section 2.6.2.3, first paragraph

The driving forces for radionuclide transport are gradients in chemical potential, pressure, gravitational potential, and temperature. In addition to adsorption, ion exchange, and precipitation, the following chemical retardation phenomena also need to be considered: aqueous speciation, dissolution, desorption, chemical exchange reactions involving substitution, isotopic exchange reactions, and ultrafiltration.

- Page 2-43, Section 2.6.2.3 Sites, paragraph 2

This paragraph appears garbled and may have words omitted.

- Page 2-43, Section 2.6.2.3, Site, paragraph 3

PORFLO is not a network type model. It is a two-dimensional, finite difference flow and transport model.

- Page 2-43, Section 2.6.2.3, Site, paragraph 5

None of the computer programs listed is likely to be of any use in analyzing unsaturated media.

- Page 2-49, Section 2.8.2.5, Model Code Development, Verification, and Validation

Comments on the first repository approaches to performance assessment are to apply to the second repository program as well.

Chapter 3

° Pages 3-12 and 13, Section 3.12.2, Plans for Resolution

We suggest that this paragraph be rewritten as follows to include affected Indian tribes wherever States are considered:

The Department recognizes the need for States and Tribes affected by waste transportation to participate in the geologic-repository program; therefore, it intends to provide ample opportunity for the States and affected Tribes to identify issues of concern. Since specific requirements are not provided in the Act, this process will be less formal than the consultation-and-cooperation process with potential repository-host States. The Department will work through existing interstate and Tribal organization and supports the formation of new Federal, State and Tribal coordinating bodies through which States and affected Tribes can express transportation-related concerns related to the repository program.

## Chapter 5

In addition to providing a status report on site characterization activities, we believe that this chapter of the Mission Plan should discuss the significant results and implication of DOE's research program.

- Page 5-2, Section 5.2.1

Paragraph two indicates that the stratigraphy and structure of the BWIP area are relatively well known. The lack of deep bore hole control at BWIP makes much of the stratigraphy relatively unknown. Due to the fact that stratigraphy at depth is not adequately defined, structural features and interpretations are unsubstantiated. Additionally, the lack of sound ties to plate tectonics make structural interpretations for the BWIP area difficult.

- Page 5-3, Section 5.2.1

Paragraph 2 indicates that the synclines around BWIP exhibit less strain than do adjacent anticlinal ridges. However, no mention is made of the high horizontal over vertical stress ratio which exists on the Cold Creek syncline. Thrust faulting and the potential for significant displacements in episodic events is an example of the type of strain which should be considered and discussed as a result of the high horizontal in situ stresses in the Cold Creek syncline.

- Page 5-6, Section 5.2.2.1, paragraph 2

ONWI-484, page 53 states that movement on Richton dome stopped within the last million years, however, the level of examination may not have been sufficiently precise to remove all doubt.

- Page 5-10, paragraph 2

The level of information is not sufficient to state that "there is no geologic structure near the site."

- Page 5-13, paragraph 1

The level of information available would appear to suggest that the Swisher site potential repository salt bed is 40-70 percent halite, the same as Deaf Smith County (See second to last paragraph, page 5-10).

- Page 5-16, last paragraph

The DOE Mission Plan never discusses the actual orientation of the stress field at Yucca Mountain and the surrounding region.

Note that hydrofracture tests have been conducted but the results are not described in detail. What are the magnitudes and orientations?

- Page 5-17, Section 5.3

This Section presents a broad overview of past site hydrogeologic investigations for the three media under study (Basalt, Salt, Bedded and Domal, and Tuff). Included are preliminary conceptualizations of the groundwater systems at these sites but only in very limited detail. In some instances better care could have been taken to qualify conclusions that are based on limited data. The investigations included in this section (Research and Development programs, NHPA Section 301(a)(5)) have been restricted to site specific studies. Identification and results of any generic research related to hydrogeology which may be supported currently by DOE are not included in this plan.

- Page 5-17, Section 5.3.1 Basalt

This section provides a good, albeit brief, summary of hydrogeologic investigations and general interpretations of how the groundwater system functions. As stated on page 2-13 (Section 2.2.2, Hydrologic Studies) "Existing conceptual models have major uncertainties associated with the areal and stratigraphic distributions of physical properties and hydraulic heads, the influence of structural and stratigraphic discontinuities, ground-water discharge areas, and hydrochemical conditions". To avoid misleading conclusions about the certainty of some interpretations provided in Section 5.3.1, we suggest further qualification of the following statements.

- Page 5-18, last paragraph

"Overall, the groundwater appears to flow southeast, toward the Columbia River along [A] hydraulic gradient of about  $10^{-4}$  m/m."

This is not yet supported completely by available data. With the exception of the BWIP SCR cited references are over a decade old. Detailed comments on this subject are provided in NUREG-0960 (SCA).

- Page 5-19, second paragraph

"Few aquifers appear to exist within the Grand Ronde Basalt beneath the Hanford Site."

While it is true the Grande Ronde Basalt has not served as a major production aquifer for agricultural use historically due to the availability of shallower aquifers there are several high-producing units within the Grande Ronde (e.g., Cohasset Flow Top, Cohasset Flow Bottom, Umtanum Flow Top).

- Page 5-20, second Paragraph

"Most hydraulic conductivity values within Grande Ronde Basalt flow tops range between  $10^{-5}$  and  $10^{-9}$  m/sec..."

It appears that there are at least one zone of higher hydraulic conductivity (Umtanum Fracture Zone;  $10^{-4}$  m/sec: DOE/BWIP SCR P 5.1-42).

- Page 5-23, Section 5.3.2 Salt

The sections reviewing salt present a good overview of the existing hydrogeologic data base. However, due to limitations in reliability and accuracy of the testing techniques (Drill Stem Tests and Single Well Pumping Tests on portions of hydrostratigraphic units) used to determine hydrogeologic parameters and the limited amount of site specific data, only generalizations about the behavior of regional groundwater flow systems can be made. Furthermore, the present data base will support other alternative conceptual groundwater flow models ("Pathways") to those presented in this section of the Mission Plan. We have comments on the following statements:

- Page 5-25, first paragraph

"Because of the low hydraulic conductivity of the evaporites ( $10^{-10}$  cm/sec or less), there is virtually no flow in this unit." [Middle Hydrostratigraphic Unit].

- Page 5-25, Pathways, second paragraph

"Intera (1983) modeled the Palo Duro Basin and concluded that hydraulic conductivity of salt is very low ( $10^{-11}$  cm/sec or less)."

No in-situ testing of salt has been done to date in the Palo Duro Basin. It appears that these values are estimates "back calculated" from computer models and limited laboratory tests of core samples. When attempting to interpret how a groundwater system functions in-situ, data such as these should be well qualified and not cited with few reservations. In addition, the statement about there being "virtually no flow" in the middle hydrostratigraphic unit is not substantiated by field data. The middle unit includes shale and carbonates and may be pathways for horizontal flow from a repository. The presence of a vertical gradient across the middle unit suggests the potential for vertical flow.

° Page 5-26, Section 5.3.2.2

"Three hydrostratigraphic units have been defined in the study area."  
[Paradox Basin]

The three hydrostratigraphic units are composed of broad groupings of aquifers and aquitards exhibiting similar hydrogeologic properties. These are defined tentatively on the basis of a single borehole and as more data become available the present subdivisions may be revised (ONWI-290).

° Page 5-27, seventh paragraph

"There seems to be no significant vertical flow (i.e., cross-formational flow) through the middle unit where the normal stratigraphic sequence has not been disrupted. The potentiometric surface in the lower unit at GD-1 is generally lower than that measured in the upper unit, which indicates that the unit is acting as an aquitard. This finding is supported by the difference in water quality above and below the middle unit."

Available data, although suggestive, is minimal to substantiate that no significant vertical flow occurs across the middle unit. The gradient across the middle unit suggests the potential for vertical flow. Vertical flow across the middle unit is suggested in the discussion on Pathways, on page 5-29.

° Page 5-31, Section 5.3.3 Tuff

The section on Tuff presents a summary of type of data available and some preliminary concepts of the unsaturated-zone flow system. Based on studies done to date, DOE has concluded that qualification of the site on the basis of pre-placement groundwater travel times is dependent largely on travel times in the unsaturated, rather than the saturated zone.

However, the NRC staff notes that preliminary estimates of travel times in the saturated zone are subject to uncertainty. Specific comments are as follows:

- Page 5-33, last paragraph

"Paths of likely radionuclide transport in the unsaturated zone at Yucca Mountain are downward to the water table, by passing through the lower part of the welded unit of the Topopah Spring member and the non-welded unit of the Calico Hills Tuff."

This may be a likely path of radionuclide transport. However, existing data do not preclude perching of groundwater in the unsaturated zone and lateral movement towards the accessible environment.

"Preliminary data indicate that the Calico Hills unit has a high effective porosity and that the matrix has a high enough conductivity to pass the probable prevailing flux of 1mm/yr or less."

There still remains uncertainty in the existing recharge flux. Currently, there is no data to support the assumption of steady state flow under which the flux of moisture through the Calico Hills is assumed to be equal to or less than the limiting saturated hydraulic conductivity of the matrix (1mm/yr). Time variant data on moisture content or matrix potential is not yet available. Contribution of flow through fractures, although less numerous than in welded units, is ignored. It is possible that flux through the Calico Hills is variable due to episodic recharge events and is not attenuated as much as is assumed.

"Based on measured or estimated properties of the non-welded unit of the Calico Hills Tuff, the probable travel time of groundwater through this unit to the water table ranges from 20,000 years (vitric part) to 50,000 years (zeolitic part)"

This estimate remains uncertain due to lack of data. It is based largely on estimated parameters and not a rigorous, state-of-the-art analysis.

- Page 5-34, second paragraph, third sentence

"Productive intervals in test wells are controlled mostly by the distribution of permeable fractures intercepted, rather than by stratigraphic position. As a result, no hydrostratigraphic units have been defined for the saturated zone."

Based on information provided to the NRC staff, DOE is unable to correlate these "productive intervals" across the site. This leads to one of the most difficult problems in characterizing the saturated zone. That is, how are "aquifers" to be defined and flow paths identified? Another difficult question is the basis for designing multiple-well tests given the unknown connectivity of these productive intervals. Hydrochemistry may be a valuable tool in answering these open questions. No results of the hydrochemistry program have been presented in this section to support this evaluation.

- ° Page 5-35, second paragraph

"Furthermore, climatic changes expected during the next 10,000 years are not likely to affect the hydrologic conditions significantly."

Based on information available to the NRC this conclusion is based on judgment rather than detailed analysis or numerical simulation.

- ° Pages 5-36 and 37, Section 5.4.1, Basalt

Redox Potential of the BWIP Groundwaters: In order to take credit for low radionuclide solubility and high sorption, BWIP has based its testing program on the assumption that (1) the ambient groundwater is reducing in nature and it will return to reducing conditions shortly after closure; and (2) that the post-closure conditions in the nearfield will return to these reducing conditions shortly after closure. Further, it is anticipated that the addition of fresh, crushed basalt to the waste package backfill will serve as a redox buffer and produce a very reducing environment at the surface of the canister. It is not clear to the NRC that (1) the ambient repository environment can ever be demonstrated to be solely reducing; (2) if it is reducing, such condition will return soon after closure; (3) after closure, it will be reducing for all of the post-closure period because the buffering capacity of the (added) basalt may be exhausted; and (4) these conditions would necessarily effect radionuclide release and transport (solubility/sorption). There are a number of factors that make prediction, based on redox conditions concerning canister corrosion, and radionuclide speciation and associated solubility/retardation uncertain:

- a. The effects of gamma radiation and, after a breach of containment, alpha radiation, may result in the continuous generation of oxygen from the radiolysis of water;

- b. The production of hydrogen, whose presence might lead to reducing conditions could escape from the very near-field as a result of its large diffusivity;
- c. The oxygen buffering capacity of the basalt may be limited to fresh surfaces. However, the basalt surfaces will have been exposed to air during the operational period and hot moist air until complete resaturation and thus could have little or no buffering capacity.
- d. The reducing capacity of the solution may not produce the desired radionuclide speciation and associated decrease in solubility and increase in sorption;
- e. The development of accurate Eh sensors and the application of laboratory Eh determinations or theoretical calculations to the repository environment has yet to be demonstrated; and
- f. The concept of a system master Eh, even if meaningful redox potential values can be measured in dilute groundwater systems, is questionable.

There is considerable risk that the test program will fail to provide the necessary assurance of waste package performance and radionuclide transport/release required by 10 CFR 60, if the program neglects testing under more realistic (oxic) conditions. If the assumed reducing conditions and their effects cannot be substantiated, there may be insufficient applicable data developed under the current testing plan to support a license application.

o Page 5-36, Section 5.4.1, Basalt

Item 1 - The source of the chloride and flouride in deeper groundwater is uncertain. What are the hypotheses about their origin? Do the higher concentrations support the conclusion that the infiltration rate of surface water or the recharge rate is nearly zero?

Item 2 - Estimates of the oxidation reduction potential (Eh) of the groundwater tend to be reducing.

Much is left unstated here. By reference to previous DOE publications, such as the SCR for BWIP, a negative value of Eh is interpreted as reducing. By convention, the Eh of the hydrogen/hydrogen cell is arbitrarily set at 0. These elements which give up their valence electrons more readily than hydrogen, such as sodium, are more reducing than

hydrogen. According to a convention adopted by some writers, the standard cell potential for half-cells based on such elements is negative. By other writers, it is positive.

In any case, there is agreement that field measurements of Eh are 1) difficult to make and 2) difficult, if not impossible, to interpret. The information lacking is what causes the negative Eh. Further, there seems to be no way of utilizing Eh in design since its value cannot be reliably predicted or attributed to any particular solution composition. At this point, NRC believes some parameter other than Eh is required for prediction of container and overpack service lives.

o Page 5-36, Item 3

"The groundwaters are slightly alkaline."

During the early years of emplacement, the elevation of temperature due to radionuclide decay heat will make the ph of pure water slightly acid. Radiolysis could also lower ph. If a ph greater than 7 is needed, DOE should provide some features in the waste package design which will accomplish this .

Under the expected reducing conditions, technetium, uranium and neptunium are well sorbed, while iodine and carbon are poorly sorbed.

While recognizing the differences in sorption behavior, DOE does not state whether it has sorbents for radioactive iodine and carbon under test.

o Page 5-36, Section 5.4.1, last paragraph

"These fractures are typically very tight and filled with secondary material."

"Tight" is a relative term. It could imply microcracks, and, if so, the amount of materials filling them must be extremely small. The use of the word "tight" conveys the impression that water flow through the extensive fractures is negligibly small. NRC feels it is premature to make judgments about the permeation rate of groundwater.

o Page 5-37, Item 1

"Groundwater solution chemistry approaches steady state conditions in a geologically short time under hydrothermal conditions."

What is a geologically short time in years? It may be true that in experiments lasting one month or one year, no further change was observed in solution composition at the end of the experimental period. This does not mean that slower transformations were not continuing.

° Page 5-37, Second Paragraph

"The basalt bentonite packing material around an emplacement canister will produce a alkaline reducing environment."

The Mission Plan should address the questions of material balance: how much water actually contacts the waste form container or the overpack? It may be that if flowing water could be kept away from the containers/overpack, its Eh-hP condition might be irrelevant.

° Pages 5-37 thru 5-40, Section 5.4.3, Salt  
Pages 5-40 thru 5-42, Section 5.4.3, Tuff

This section contains no discussion of uncertainty; therefore, claims or assertions about site conditions should be supported by references. Without supporting documentation, the NRC has no way of evaluating the extent and adequacy of the information being developed to support repository characterization.

° Pages 5-52 and 53, Section, In-Situ Stress

Results of USGS-OFR-83-669, "Southern Great Basin Seismological Data Report for 1981 and Preliminary Data Analysis," suggest from focal plan solutions that the region is under a high northeast-southwest horizontal compressive stress.

° Page 5-53, Section 5.7.2, Salt, paragraph 5

We believe that the advantages of site redox conditions are premature/optimistic and do not reflect the uncertainties associated with the assumption (see Comment on Sections 5.4.4, Salt and 5.4.3, Tuff, above)

° Page 5-53, Section 5.7.2, Salt, paragraph 5

We believe that the discussion of "issues of concern" is incomplete without including organics. Radionuclide organic complexes can be highly mobile and may affect DOE radionuclide release calculations. (see comment on Section 5.7.1, above).

Chapter 6

- ° Page 6-1, second paragraph

The Commission's preliminary concurrence decision on the guidelines was announced on March 9, 1984, not on February 22, 1984, as indicated.

Chapter 7

- ° Page 7-16, Section 7.4, Plans for Investigations That May Affect Isolation Capabilities

The DOE test program to be conducted in the "exploratory shaft" was not discussed in this section. These tests and activities have the potential for affecting the waste-isolation capabilities of a site through the introduction of exogenous materials, such as organics, to the repository system. Radionuclide organic complexes are highly mobile and may effect DOE radionuclide release calculations. In addition, the listing at the beginning of this section should include "3. Mining and excavation of underground facilities."

Chapter 8

° Page 8-3, Paragraph 3

The statements concerning the very low potential for leaching and the structured resistance of (borosilicate) glass imply that an overpack is unnecessary for the borosilicate waste form. NRC believes these statements should be qualified by recognition that 1) leaching of radionuclides, not glass, is the issue, 2) such leaching appears unacceptably high without an overpack, and 3) under compressive load, the glass will fracture.

° Page 8-4, Paragraph 3

"The thickness of the reference canister (for salt) ranges, up to 15 centimeters."

Have remote welding techniques and subsequent inspection techniques been developed sufficiently to permit 100 percent inspection of the welds? What will be done about welds that fail to pass inspection? How will the corrosion resistance of the canister metal be affected by high temperature welding? NRC feels DOE should acknowledge some concern about such questions.

Additional Comments

Some of the definitions provided in the Mission Plan (Volume I, 3-A-3) are not consistent with those presented in NRC Regulations (10 CFR 60, 60.2). DOE should standardize the definition and usage of commonly used terms.

A glossary of abbreviations, definitions, and technical terms used in the Mission Plan would be most useful and should be prepared, especially in view of the widespread public distribution of the final Mission Plan.

The document should contain a comprehensive list of references, with appropriate citations in the text for reports and documents referred to but not identified.

ENCLOSURE 3

	<u>Areas That Are Not Clear On Regulatory Requirements</u>	<u>Areas That Are Not Clear On Performance Goals</u>	<u>Areas Requiring Additional Prelicensing Consultation</u>	<u>Areas That Differ From Existing Regulations</u>
<u>Enclosure 1 Objections</u>				
#1	X		X	
#2	X		X	?
#3	X		X	?
#4		X	X	
#5				
#6	X		X	?
#7	X		X	
Specific	X	X	X	X
<u>Enclosure 2 Comments</u>				
#1	X		X	
#2		X	X	
#3	X	X		
#4	X			
#5				
#6			X	
#7	X			
#8				
#9				
Specific	X		X	