UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 29, 1994

Dr. Daniel E. Dreyfus, Director
Office of Civilian Radioactive
Waste Management
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585

SUBJECT: STAFF COMMENTS ON THE U.S. DEPARTMENT OF ENERGY'S FIVE YEAR PLAN

Dear Dr. Dreyfus:

The purpose of this letter is to transmit to you the NRC staff comments related to the "Yucca Mountain Site Characterization Project Five-Year Plan (FYP) for Fiscal Years 1996-2000," dated October 12, 1994. We recognize that this is a "predecisional draft" document. However, the importance of the high-level waste (HLW) management program and the extensive nature of the planned changes to the U.S. Department of Energy's (DOE's) implementation make it prudent for the NRC staff to comment at this time.

As discussed below, we have a number of concerns which we plan to address with you as we meet on this subject in the coming months. Note that we do not believe that it is necessary for DOE to revise the FYP to resolve our comments. Seven topics, in particular, are drawn to your attention. The attached Specific Comments detail staff observations and areas where additional information related to these topics will be required.

First, staff has several concerns related to the schedules delineated in the FYP. While noting that the schedules are aggressive, our principle concern is the impact of these schedules on the ability to collect data that are sufficient to support site suitability determinations and subsequent licensing actions.

Second, additional information is required in three important areas related to the regulatory process: (i) the rationale for adopting the revised baseline site characterization program proposed in the FYP; (ii) compliance with 10 CFR Part 60 regulatory requirements; and (iii) clarification of NRC's role in various aspects of the site suitability process. In particular, the DOE FYP proposes changes and reductions to site characterization activities. The staff expects that the objective technical bases for these changes will be documented in the next Site Characterization Plan (SCP) progress report, as required by 10 CFR 60.18(g). The staff will comment at that time, as appropriate, in accordance with 10 CFR 60.18(i). DOE should note that 10 CFR Part 60.18(g) requires that progress reports be provided at least every six months. It does not preclude DOE from providing progress reports on a more frequent basis, if significant events so warrant.

Third, staff is concerned with the current approach which defers key repository design aspects, including selection of a thermal-loading strategy, until late in the repository development process. Determinations regarding site suitability must be made in the context of the influence of the

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repository design on the geologic setting. Consequently, a reasonably complete reference repository design and firm thermal-loading strategy, including information related to the reference waste package, are needed to support site suitability determinations and associated assessments of repository performance.

Fourth, successful implementation of the program approach appears to be based on the validity of a few technical assumptions outlined in the Isolation Demonstration Strategy (IDS). It also appears that DOE assumes that additional site characterization data or changes in the conceptual design will have little effect on the anticipated major processes. Each of these assumptions remains to be tested; if they cannot be proven, the lack of site characterization data and a detailed conceptual design could invalidate earlier conclusions regarding the need to collect additional information.

Fifth, although the scope of the FYP might be appropriate for such a high-level planning document, NRC staff requires a greater level of detail to evaluate the technical integration and regulatory sufficiency of the Program Approach. Particular attention should be given to the rationale and plans for longer term investigations that will be used to address the conservative bounding assumptions and calculations used in the license application. SCP progress reports, updates to the license application annotated outline (AO), Technical Implementation Plans, and DOE/NRC technical exchanges can be used to present this additional required information.

Sixth, full implementation of the license application AO process early in FY96 is an important step in assuring that NRC has ample opportunity to review and comment on the adequacy of DOE's licensing strategy and the data being collected in support of that strategy. Development of AOs and response to NRC comments on them can provide DOE with effective measures of progress in the repository program.

Finally, we note that performance assessments (PA) are critical to both the determinations of site suitability and the eventual licensing determinations that must be made under 10 CFR Part 60. Further delineation of the role of PA in the process and the availability of data for use in PA is required particularly in view of DOE's plan to use bounding assumptions. Specifically, adjustments to site investigations and performance assessment programs will require clarification after the U.S. Environmental Protection Agency has promulgated a standard for the proposed Yucca Mountain repository.

We believe that existing vehicles for interactions between our staffs can be effective in providing the additional information we require to fulfill our statutory responsibilities. In particular, SCP progress reports, updates to the AO, and more frequent technical exchanges should be used. In this regard, the planned DOE/NRC management meeting on December 2, 1994, will be an important opportunity for initiating what we anticipate will be a continuing dialogue related to implementation of the DOE FYP.

Please contact me or Mr. Joseph Holonich, Chief of the High-Level Waste and Uranium Recovery Projects Branch, if you have any questions concerning this matter. I can be reached at (301) 415-7800, and Mr. Holonich can be reached at (301) 415-6643.

Sincerely,
Original signed by
Robert M. Bernero
Robert M. Bernero, Director
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Enclosure: As stated

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COMMENTS OF NRC STAFF ON DOE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT FIVE-YEAR PLAN

POTENTIAL IMPACTS OF SCHEDULE

While the staff considers the development and implementation of the schedules presented in the Five-Year Plan (FYP) plan to be the Department of Energy's (DOE) responsibility, the following comments present the Nuclear Regulatory Commission's concerns with these schedules and their effect on the technical program.

1. There is a conflict in the schedule for providing NRC sufficiency comments in the Site Recommendation Report (SRR). The schedule for annotated outline (AO) Rev 5, which DOE suggests the NRC use as a basis for its comments, is not available for NRC review and comment prior to completion of the SRR.

2. The apparently optimistic schedules presented in Chapters 2 and 4 of the FYP could lead to a conclusion that data collection will be curtailed because of arbitrary schedule restrictions or resource constraints (p. 1-6, Technical Status; p. 1-9, Program Approach), rather than being based on objective measures of adequacy, limitation of uncertainty, or similar considerations. The NRC recommends that DOE conduct a critical review of these schedules. In addition, DOE should review the staff's concern on the use of expert judgment discussed in the staff's letter dated July 22, 1992, transmitting comments on the Early Site Suitability Evaluation.

3. The schedule presented in Chapter 4 is very aggressive. For example, it may not allow time for a proper review of Total System Performance Assessment Reports (TSPAs) and may significantly limit the increase in understanding of repository performance that might be expected in an iterative, interactive process such as TSPA.

4. The staff is concerned that, allowing for the time to prepare technical basis reports and complete peer review and comment resolution, most suitability findings will be made based on data that are now available or may become available within the next two years. It would be useful if DOE could estimate the increase in uncertainty in the context of the need to have reasonable assurance, as required by 10 CFR 60.101(g), that will result from pursuing the draft FYP schedules rather than the original Site Characterization Plan (SCP) program. More importantly, DOE should describe its method for considering this increased uncertainty in the determination of sufficiency in data collection.

5. The description and schedules for the planned Multi-Purpose Canister (MPC) topical reports identified in Figure 4-2 are inconsistent with the planned topical reports listed in the August 23, 1994, letter from D. Dreyfus to I. Selin. Also, the MPC design Safety Analysis Reports for both MPC storage and transportation certification are scheduled for completion during FY95-96. These actions will be carried out without the benefit of final information from the characterization of Geochemistry and Post-Closure Rock Characteristics which is scheduled to

be available in mid-1997 (p. 2-18). The staff requests that these inconsistencies in MPC planning be clarified.

6. We note that the Calico Hills access ramp will not be excavated until 1999-2000 (p. 2-16), after site suitability has been determined and perhaps too late to include the information in the license application. If DOE believes it is necessary to collect data from that unit to characterize the repository site, it would appear that earlier investigation would be needed as part of the proposed Isolation Demonstration Strategy (IDS).

INTERPRETATION AND IMPLEMENTATION OF THE REGULATORY PROCESS

Additional information is required in three important areas related to the regulatory process: (i) the rationale for adopting the revised baseline site characterization program proposed in the FYP; (ii) compliance with 10 CFR Part 60 regulatory requirements; and (iii) clarification of NRC's role in various aspects of the site suitability process. Specific examples follow.

1. The FYP states that some previously planned studies are "no longer needed in support of licensing" (p. 4-14). Since such changes would represent modifications to the SCP, the NRC staff expects that the objective technical bases for them will be documented in the next SCP progress report, as required by 10 CFR 60.18(g), and will comment at that time, as appropriate, in accordance with 10 CFR 60.18(i). The staff is particularly interested in this issue in view of concerns which have been previously documented regarding the adequacy of currently planned investigations.

2. Although used as a central basis for development and justification of investigations delineated in the SCP, the role of performance allocation in developing the FYP is unclear. DOE notes (p. 4-25) that a performance allocation system study will be undertaken in FY96, indicating that the FYP was not developed using performance allocation. If DOE is proposing to modify or replace this process, NRC should be notified through an SCP progress report.

3. In the absence of a revised performance allocation or similar approach, it is not clear whether the FYP provides a systematic approach for the collection and analysis of data relevant to the full range of repository system siting, design, construction, and performance related activities.

4. DOE should further define its plans for assuring adequacy of data for demonstrating compliance with 10 CFR Part 60. This is a particular concern in areas where NRC has already provided extensive commentary. For example, in the area of volcanism, there are 11 open comments on Study Plan 8.1.3.1.8.1.1; 10 comments and 2 questions open on Study Plan 8.3.1.8.1.2; and 7 comments and 10 questions open on Study Plan 8.3.1.8.5.1.

5. The FYP states (p. 1-5, para. 2) that confirmation of the hypothesis of low ground-water flux "could by itself establish compliance with regulatory limits on releases to the human environment." Although this may be true for the as-found state, a more comprehensive multi-barrier approach to assessing repository performance is required by 10 CFR Part 60. Broader consideration of regulatory requirements, including upset conditions, must be incorporated in the demonstration of compliance.

6. The apparent decoupling or segmentation of the overall program into "three sets of investigations" (p. 1-6, Technical Status) appears to be inconsistent with discussions presented elsewhere (e.g. Table 2-1), where it appears that performance will be assessed as part of the 10 CFR Part 960 evaluation (i.e. at least some of the "guideline descriptions" are expressed in terms of calculated releases to the environment). Staff believes that site suitability can only be evaluated in the context of the level of performance provided.

7. The stated objective of the site suitability program (p. 2-8) causes concern regarding the importance and integrity of the technical program. Although the intent is to make high-level findings (HLFs) and develop a site recommendation report, the objectives supporting that goal are strictly programmatic (i.e., showing demonstrable progress). The staff recommends that program objectives reflect a greater concentration on technical site suitability issues.

8. Clarification is required regarding DOE's understanding of the role of NRC in evaluating the preliminary sufficiency of at-depth site characterization analyses and the waste form proposal. On page 4-61 of the FYP DOE correctly reflects NRC's responsibilities and suggests that NRC base its comments on AO Rev 5 in 2000. However, on page 2-33 the FYP states that NRC is to review the Site Recommendation Report (SRR) and comment on the sufficiency of the information upon which the recommendation is based. This statement incorrectly reflects NRC's role. It could cast NRC in an inappropriate role with respect to the site suitability process.

REPOSITORY DESIGN AND THERMAL LOADING STRATEGY

Staff is concerned with the current approach which defers key repository design aspects, including selection of a thermal-loading strategy, until late in the repository development process. Determinations regarding site suitability must be made in the context of the influence of the repository on the geologic setting.

1. It is not clear how DOE will be able to demonstrate site suitability in the absence of a reasonably well-established repository design, particularly without bounds on the thermal-loading strategy. This decision will be deferred until after submittal of the license application for construction (p. 1-7). Elsewhere in the FYP, DOE indicates that a "final decision" regarding thermal loading will not be made until "late during repository operations" (p. 2-16). A reasonably

complete reference repository design and firm thermal-loading strategy are needed to support site suitability determinations and associated assessments of repository performance.

2. The FYP implies that thermal effects studies are appropriately considered a licensing issue rather than a site suitability issue "because of the long lead time required to obtain results" (p. 4-18). The staff recommends that a better technical or regulatory basis be provided for designating these studies as part of the licensing program. DOE's evaluation should specifically consider whether pursuing license submittal in the absence of detailed information on thermal loading would be consistent with applicable statutory and regulatory requirements.

ISOLATION DEMONSTRATION STRATEGY

The IDS (pp. 1-7 and 1-8) is a key aspect of the Program Approach. NRC observations on this approach include the following.

1. Successful implementation of the program approach appears to be based on the validity of a few technical assumptions outlined in the IDS. It also appears that DOE assumes that additional site characterization data or changes in the conceptual design will have little effect on the anticipated major processes. Each of these assumptions remains to be tested; if they cannot be proven, the lack of site characterization data and a detailed conceptual design could invalidate earlier conclusions regarding the need to collect additional information.

2. It appears that the IDS is related to DOE's performance allocation process. However, changes to the baseline performance allocation that was delineated in the SCP and agreed upon by the NRC and DOE are not addressed. Of particular interest are both the allocations of performance and the definition of interfaces among systems. A delineation of these interfaces should be provided to the staff so that DOE's systems approach to evaluating repository performance can be evaluated. The revised performance allocation strategy, which is scheduled for completion in FY96, could be used for this purpose. However, the staff is concerned that this document will not be available until halfway through the site suitability process. The next SCP progress report could be used to present changes to the performance allocation on a more timely basis.

3. The IDS indicates that fractures are "good" in that they will focus the flow of moisture. This is a new perspective which is currently untested. Furthermore, it is not clear to the staff how such preferentially conductive features would be identified, characterized, tested, and incorporated in models of site and repository performance.

4. The staff is not aware of previous DOE studies that bound the contact of water with waste packages. Additional technical justification for these bounds, based on theoretical considerations and appropriate data, will be required. An appropriate place for discussing these results would be the next SCP progress reports.

5. In confirming the design of long-life waste packages, DOE will need to provide technical justification that the relationship between waste generated heat and groundwater flow and chemistry has been determined. The fact that much testing remains in this area as a part of DOE's plans should be reflected in the next SCP progress report.

6. DOE acknowledges that ongoing tests of waste-form dissolution rates and radionuclide solubilities are producing a "significantly changed set of bounds" (p. 1.8). The basis for these bounds, including such matters as sorption in fractures, effectiveness of matrix diffusion, and influence of colloid formation, needs to be provided.

7. The role and effectiveness of dilution in the saturated zone warrants particular attention, since it represents a significant change from earlier approaches. Staff needs information regarding the testing and analysis methods that DOE plans to use to confirm this element of the IDS.

ADDITIONAL INFORMATION RELATED TO THE FYP

Additional information will be needed to augment the high-level plans provided in the FYP. Effective vehicles for providing this information include SCP progress reports, updates to the license application AO, Technical Implementation Plans, and DOE/NRC technical exchanges. Examples of such required information follow.

1. The staff is concerned whether data will be sufficient to demonstrate compliance with 10 CFR Part 60 considering schedules presented in the FYP for data collection, technical basis report development, and peer reviews, as well as the relatively short period between a technical site suitability determination and license application submittal. Further interactions will be required to ensure that data collection is not curtailed because of arbitrary schedule restrictions rather than being based on objective technical measures of adequacy.

2. The IDS appears to rely almost entirely on "bounds" for various phenomena. However, even within the context of these bounds, there appears to be little or no treatment of potentially adverse conditions. The IDS should be clearly related to licensing information, including assessments of geologic conditions which could be adverse to performance (Chapter 2).

3. While "increased emphasis on engineered barriers supports the use of conservative and/or bounding assumptions" (p. 2-15), technical uncertainties associated with the MPC concept could complicate the development of bounding assumptions to be used in the IDS. Technical issues related to MPC development will require specific consideration in developing bounding assumptions and initial conditions in the repository. Furthermore, available site characterization data must be included in design of those aspects of the MPC which could be influenced by repository environmental conditions.

4. Although there is related discussion in the text of the FYP, the pertinent schedules (Figures 2-3 and 4-2) do not delineate any continuing studies following the HLFs, giving rise to concerns regarding

both the adequacy of data for licensing and the continuity of the overall site evaluation and licensing processes as reflected in the performance confirmation requirements in 10 CFR Part 60, Subpart F. Most of the licensing activities presented in the FYP relate to excavation, design, and documentation. The staff requests more detailed information concerning these activities.

IMPLEMENTATION OF THE ANNOTATED OUTLINE PROCESS

Full implementation of the license application AO is an important step in assuring NRC has ample opportunity to review and comment on the adequacy of DOE's licensing strategy and data being collected in support of that strategy. Development of AOs and response to NRC comments on them can provide DOE with effective measures of progress in the repository program as well as fulfill the statutory mandate for both agencies to conduct an effective pre-licensing consultation program. However, DOE needs to remedy one significant staff concern in its approach. The staff believes that, rather than providing licensing information in topical reports, such information should be reported in the AO.

The planned approach to provide topical reports on individual findings is a variation of the idea proposed by DOE in 1993 in the "Proposed Alternative Strategy for the Department of Energy's Civilian Radioactive Waste Management Program." In September of 1993, the staff expressed its concern with regard to that approach, since the approach does not appear to take into account the requirements of 10 CFR Part 60 for demonstration of compliance with the siting criteria as they relate to performance. Evaluations of the siting criteria must demonstrate that, considering the potentially adverse conditions (PACs) found to be present, in combination with other characteristics of the site and design, the performance objectives relating to the isolation waste, as set out in §§ 60.112 and 60.113, will be met. The only individual finding that could be made in a topical report would be whether a PAC was determined to be present or absent. However, this determination, as well as the evaluation of any effect on performance, would be more appropriately presented in the AO. This is an example of why the staff believes that DOE should use the AO rather than topical reports to present repository systems-based evaluations, made in the context of 10 CFR Part 60 requirements. Furthermore, although DOE has limited the number of AO iterations to one or two per year, staff believes that a partial update of the AO could be provided whenever significant new information becomes available. DOE should recognize that the results of a staff review of either a topical report or the AO are not binding on the staff, licensing boards, or the Commission.

The NRC staff considers that full implementation of the AO process (p. 4-14) should include, among other things, the following.

1. Presentation of an AO which is consistent with the Format and Content Regulatory Guide (FCRG), associated information needs, and the License Application Review Plan. DOE should assume that format modifications with respect to the draft FCRG that are found in Revision 0 of the LARP will be incorporated in the final version of the FCRG.

2. Consideration of the repository system in both site suitability and licensing determinations. Although interfaces between subsystems appear to have been considered in developing the four-part IDS, they are not described or discussed in the FYP and, therefore, should be documented in the AO.

3. Documentation that technical investigations required for licensing as described in the SCP and subsequent progress reports that have been provided to the NRC have been completed. This information needs to be provided in order to resolve apparent inconsistencies in the FYP. For example, Figure 4-2 does not indicate further investigations on topics such as tectonics and volcanism will be made subsequent to HLFs in these areas.

4. Assurance that collection of data to support suitability findings on the natural system are consistent with investigations being carried out in the Exploratory Studies Facility. For example, NRC staff notes that in the FYP the investigation of Solitario Canyon occurs after the associated HLF on tectonics has been made.

5. Elimination of the time delay between the HLF and AO development schedules in similar areas by consideration of preparing HLF technical basis reports and associated AO chapters on a parallel schedule to assure consistency of site suitability and licensing determinations.

6. Description and delineation of the process by which DOE will determine adequacy of data for licensing. In the SCP, this was done using an issue resolution and performance allocation process. While 10 CFR Part 960 requires DOE to make an HLF which includes evaluating whether or not additional data will change the findings, the FYP does not provide a means for conducting a similar evaluation regarding licensing. Unless DOE reports changes to the performance allocation process continued in the SCP, the staff must assume that the performance allocation process outlined in the SCP will continue to be used.

7. Documentation of the process and logic that will be used to evaluate the adequacy of bounds and conservativeness of assumptions incorporated in the AO.

ROLE AND USE OF PERFORMANCE ASSESSMENT IN SUITABILITY DETERMINATIONS

Iterative performance assessments are critical to both the determinations of site suitability and the eventual licensing determinations under 10 CFR Part 60. Specific staff comments in this area include the following.

1. It is expected that performance assessments will be used to examine interactions among processes at the site. The site suitability process as presented in the FYP seems to indicate that processes will be evaluated independently or in small groups when developing HLFs. Accordingly, the role of overall and subsystem performance assessments in reaching HLFs will require clarification.

2. According to the FYP, the last TSPA (Total System Performance Assessment Report, 1997) will be published in January, 1998. This TSPA may not be able to incorporate the Geochemistry and Post-Closure Rock Characteristics information obtained in mid-1997. The schedules for conducting TSPAs should be examined to ensure that they make appropriate use of all available site characterization data. DOE should also consider placing this information in Chapter 6 of the AO rather than providing separate documents. This would help ensure integration of the DOE program and licensing work, and have vehicle for incorporating site characterization data as it becomes available anytime before final LA.

3. In its approach to demonstrating waste isolation, the FYP states that the revised U.S. Environmental Protection Agency (EPA) Standard "must" limit the annual effective dose equivalent (p. 1-5). However, in the licensing assumptions it is stated that imposition of a dose standard would require "several adjustments" to site investigations and performance assessment programs which are not addressed in the FYP (p. 4-12). Adjustments to site investigations and performance assessment programs to implement an annual effective dose equivalent standard will require further delineation after EPA has promulgated a standard for the proposed Yucca Mountain repository. The staff expects changes would be reported in SCP Progress Reports.

Please contact me or Mr. Joseph Holonich, Chief of the High-Level Waste and Uranium Recovery Projects Branch, if you have any questions concerning this matter. I can be reached at (301) 415-7800, and Mr. Holonich can be reached at (301) 415-6643.

Sincerely,
Original signed by
Robert M. Bernero
Robert M. Bernero, Director
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Enclosure: As stated

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