

August 26, 1998

**MÉMORANDUM TO:** Carl J. Paperiello, Director  
Office of Nuclear Material Safety and Safeguards

**FROM:** John T. Greeves, Director  
Division of Waste Management  
Office of Nuclear Material Safety and Safeguards

**SUBJECT:** STAFF REVIEW OF U.S. DEPARTMENT OF ENERGY  
VIABILITY ASSESSMENT OF YUCCA MOUNTAIN SITE FOR  
PROPOSED HIGH-LEVEL WASTE REPOSITORY

Attached for your information is the guidance document for U.S. Nuclear Regulatory Commission (NRC) staff review of the U.S. Department of Energy (DOE) Viability Assessment (VA). The U.S. Congress has requested DOE to prepare the VA as a management tool to assist in making an informed decision regarding the viability of the Yucca Mountain site for disposal of high-level waste. Although there is no statutory requirement for NRC to review the VA, it is anticipated that Congress will ask NRC for its views.

The VA will consist of four parts: (1) Preliminary design concept; (2) Total System Performance Assessment (TSPA); (3) License Application Plan and cost estimate; and (4) Costs of construction and operation. NRC staff's review will focus on the TSPA for the reference design and the License Application Plan, and not on the cost estimates.

NRC staff will use information in its Issue Resolution Status Reports (IRSRs) together with its independent performance assessments to guide its review of the VA. Emphasis will be given to the acceptance criteria and the open items in the IRSRs.

Staff plans to provide the results of its review of the VA to the Commission three months after the VA is published by DOE. The staff review of the VA will be documented in the following two ways: (1) A Commission paper will summarize DOE progress, identify potential licensing vulnerabilities and any major concerns, and recommend Commission action; (2) Revisions to IRSRs will document technical concerns that do not constitute major licensing concerns.

Attachment: As stated

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**GUIDANCE FOR NRC'S REVIEW OF DOE'S VIABILITY ASSESSMENT**  
(August 25, 1998)

**Background and Assumptions**

- o DOE's VA was requested by Congress and is a management tool that will provide a basis for making an informed assessment of the feasibility to proceed with the process for licensing and constructing a repository at Yucca Mountain.
- o DOE's VA consists of the following four elements:
  1. Preliminary design concept
  2. Total system performance assessment (TSPA)
  3. License Application (LA) plan and cost estimate
  4. Costs of construction and operation
- o NRC's review of DOE's Viability Assessment (VA) is not an explicit regulatory requirement. However, NRC expects to be asked by Congress to comment on DOE's VA. NRC's independent licensing view may be useful input to potential Congressional decisions about the future of the national program.
- o Early feedback to DOE resulting from reviews of draft and final VA documents will be a continuation of NRC's ongoing issue resolution activities during the precicensing phase. Early feedback has already been given to DOE in FY 1996-1998 (see attachment 1).
- o Because it is uncertain when the EPA standard will be released, NRC will assume an individual risk performance objective based on calculation of an all pathways dose to an average member of the critical group for the purpose of conducting its review and related independent performance assessments.

**Objectives**

- o Identify DOE progress in developing the information necessary for a complete license application.
- o Determine the potential for licensing vulnerabilities that could either preclude or pose a major risk to licensing. Potential licensing vulnerabilities could be identified by:
  - Independent staff calculations indicating a clear inability to meet a risk standard.
  - Staff identification of significant and unresolvable uncertainties (unlikely to be reduced with additional data or analyses or mitigated by engineering features) that are likely to jeopardize or preclude successful demonstration of compliance in a licensing proceeding.

- o Determine if there are major concerns with DOE's test plans, design concepts (to the extent resources permit) and Total System Performance Assessment (TSPA) that, if not resolved by DOE, might result in an incomplete or unacceptable license application. This would include considering if plans and schedules for testing, TSPA, and reference designs are adequate.

#### Scope and Approach

- o The staff will review the final VA and document the results in the following two ways:
  1. Commission paper. Submit a paper to the Commission within three months after receipt of the VA that: summarizes DOE progress, determines the potential for licensing vulnerabilities, summarizes major licensing concerns, and recommends Commission action, if any.
  2. The identification of technical concerns by NRC staff that do not constitute major licensing concerns will be documented through the revisions to the IRSRs. This feedback is expected to assist DOE in preparation of the license application.
- o In order to prepare a Commission paper within three months after the final VA is issued by DOE, NRC will take the following approach:
  1. Continue its ongoing issue resolution program prior to issuance of the VA. This includes reviewing information that will support the VA and providing DOE with early feedback to identify and resolve differences. DOE has agreed to continue to provide draft information for NRC to review. Feedback is planned in IRSRs, NRC-DOE interactions and letters to DOE.
  2. Prepare a draft of Commission paper and seek staff comments prior to issuance of the final VA in order to expedite the completion of the final paper.
- o One goal of providing DOE with early feedback prior to final VA issuance is to have no surprises as a result of the staff's review of the VA unless significant new data or analyses are revealed as part of the VA. In other words, no significant comments should need to be made at the time the staff reviews the final VA that have not already been identified (in writing, if time permits) to DOE for their consideration as they prepare the VA unless these comments result from significant *new* data, information or analyses which the staff has not had access to before.
- o Focus NRC's review on the ten Key Technical Issues (KTIs) most important to post-closure repository performance, which is a continuation of the NRC's prelicensing program during FY 1996-1998. Therefore, NRC will review information in the VA related to the KTIs and their subissues.

- o **NRC will use information in its IRSRs together with its independent performance assessments to guide its review. Emphasis will be given to the acceptance criteria in section 4.0 and unresolved differences in section 5.0 of the IRSRs. Acceptance criteria for all KTIs will be completed prior to the review, although subsequent revisions will occur as needed to reflect new information. Not all review methods will be completed prior to receipt of the VA.**
- o **Degree of Quality Assurance (QA) applied to VA information will not be within the scope of the VA review since the VA is not a licensing document. However, QA activities will continue as part of NRC's ongoing review of DOE's QA program for licensing. Furthermore, in reviewing the LA plan staff should plan to comment on any major quality related concerns that must be addressed prior to submittal of the LA.**
- o **Specific scope and approach for the four elements of the VA:**
  - **Preliminary Design Concept**
  - **It is anticipated that DOE's VA will include reference repository and waste package designs consisting of various elements important to performance, three design options (backfill, drip shield, and ceramic coating), the benefits of design options to performance, and concepts of repository preclosure operations.**
  - **NRC will review the reference repository and waste package design concepts, and qualitatively evaluate the potential benefits to postclosure performance of the three design options.**
  - **NRC will review technological feasibility of the reference design and design options only as it relates to post-closure repository performance and the ability to demonstrate compliance in the presence of performance uncertainties.**
  - **NRC will review those aspects of the concept of operations that can significantly affect DOE's thermal strategy and repository postclosure performance. These reviews will include the planned operation of the subsurface ventilation system, waste loading, and the timing of backfill emplacement.**
  - **NRC's review will focus on design feasibility and design issues which may pose licensing vulnerabilities with respect to DOE's ability to demonstrate that the repository engineered features make a significant contribution to overall repository performance.**

## **TSPA**

- A three-part review process will be used consisting of evaluating DOE's approach to abstraction of key processes, reference case data set, and TSPA-VA results.**
- 1. Evaluation of DOE's approach to abstractions.**
  - The evaluation should follow June 10, 1997, guidance on preparation for TSPA technical exchanges with focused comments on DOE's abstractions presented at the technical exchanges on TSPA-VA (Attachment 2.)**
  - Early feedback should be given to DOE as comments documented in the meeting summaries of the technical exchanges, and the final results should be provided in the IRSR on TSPA Methodology and other IRSRs as appropriate.**
- 2. Evaluation of DOE's reference case data set.**
  - The evaluation should use the NRC's reference data set, i.e., the data set documented in the TPA users guide and available to the staff through Computerized Risk Assessment & Data Analysis Lab (CRADAL) that has been revised in light of in-house process-level and system level sensitivity studies, and should focus on those parameters that have been identified through our PA efforts as being important to performance.**
  - A review of the DOE reference case data should compare the NRC reference data set to the data provided by DOE, identify those parameters that differ between the sets of data and that also have a significant impact on post-closure repository performance, and identify parameters and processes that will require further consideration either before or after the LA.**
  - These results will guide the review of the LA plan.**
- 3. Evaluation of the results of DOE's TSPA-VA.**
  - The evaluation should rely heavily on knowledge obtained from the prior two stages of review and should include the staff's independent analyses using the TPA code with our input parameters.**
  - The results of these analyses should be evaluated in the context of past TSPAs and iterative PAs (to the extent warranted, recognizing TSPAs are iterative).**

-- Reviews would occur prior to delivery of the final TSPA-VA, and our conclusions will be reevaluated in response to differences in abstractions or the base case that are identified in the final TSPA-VA that impact DOE's overall analysis.

-- The review should identify major concerns with DOE's ability to demonstrate compliance with a risk based performance objective, identify those components of the system most important to meeting the performance objective, identify major concerns with DOE's approach to abstracting process-level models and with relevant input parameters for those components, and provide insight into future testing needs that will support the review of the LA Plan.

#### **LA Plan and Cost Estimate**

- VA will include test plans, schedules, and costs needed to prepare the LA.
- NRC should review the activities being costed to make sure that no important omissions exist in areas of regulatory interest.
- NRC should review the adequacy of test plans and schedules for a complete LA using the approach and results for determining sufficiency of data in the IRSR on TSPA Methodology and the results of the TSPA-VA review described above. In addition the acceptance criteria in the currently available IRSRs will be used to conduct these reviews. Further guidance on how sufficiency of data will be reviewed is provided in the IRSR on TSPA Methodology.
- NRC should review DOE's plan for qualifying data for licensing in the context of ongoing concerns regarding the quality assurance program.

#### **Costs of Construction and Operation**

- It is expected that DOE's VA will include costs and schedules for performance confirmation and for construction, operation, and closure of a repository.
- NRC should not review cost estimates and schedules for construction, operation, and closure because this information is not within the scope of NRC's regulatory responsibility. Further, NRC should not review the associated technical basis, such as

surface facility designs and construction methods, because this preclosure information is not within the current scope of the NRC KTI program.

- NRC should review the performance confirmation test plans and schedules as part of reviewing the test plans and schedules for the LA.

- o **Products**

- The staff's strategy to review the VA, incorporated as part of the HLW program status briefing to the Commission.
- Commission paper summarizing results of review, attachment with major comments and recommendations for Commission action, if any.
- Revisions to each IRSR reflecting results of reviews, with the staff concerns related to each KTI providing valuable feedback to DOE in preparation of the LA.
- Attachment 1 is a list of the most important of interactions to date, that have provided early feedback to DOE prior to VA.

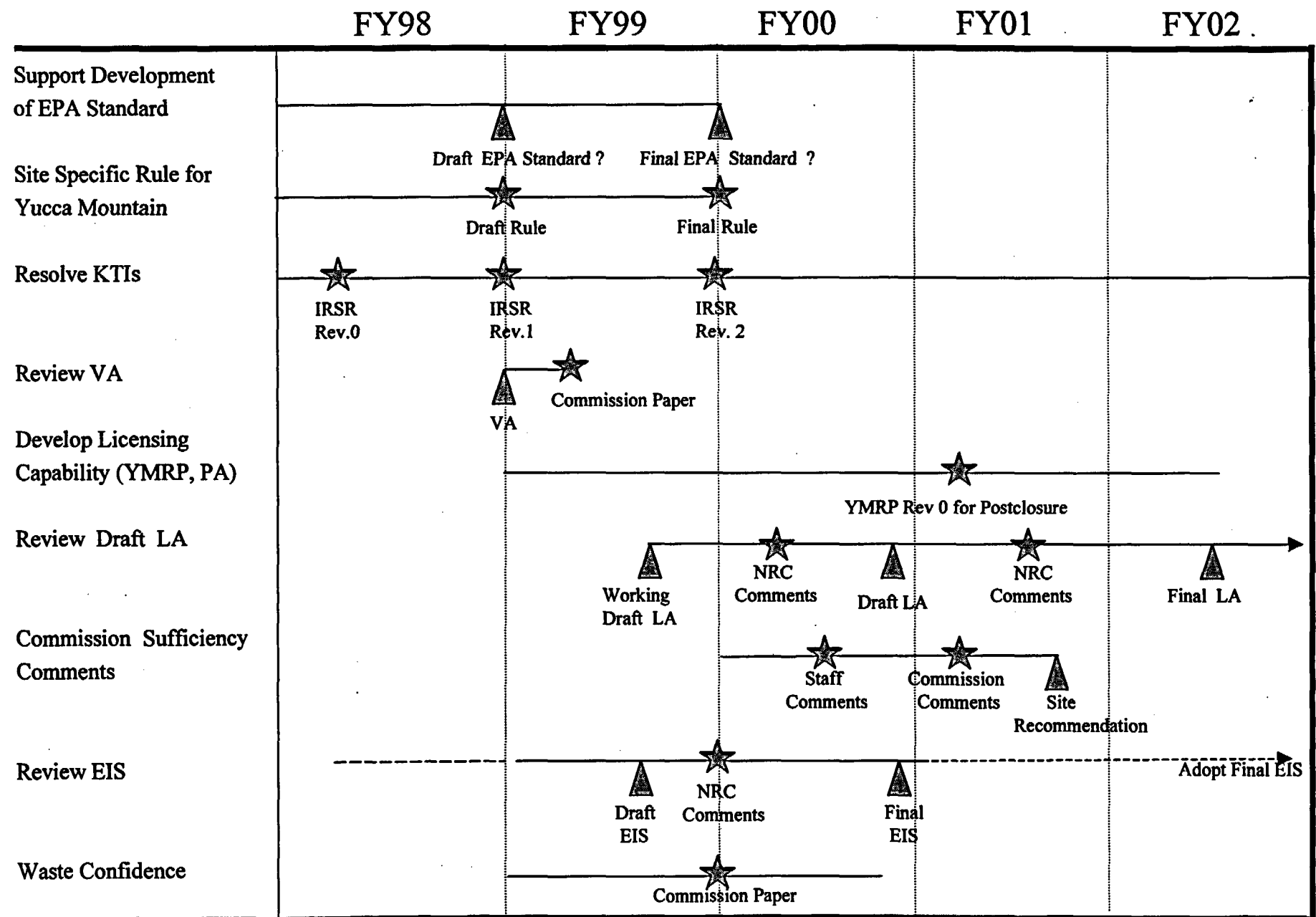
- o **Schedule of Activities**

- Figure 1 gives an integrated schedule of activities related to NRC's VA review.

- o **Public Input**

- NRC-DOE meetings and technical exchanges are open to the State of Nevada, counties, Indian Tribes, and the public. Opportunities are given for input from those in attendance.

# HLW PROGRAM SCHEDULE



★ NRC MILESTONE

▲ DOE or EPA MILESTONE

Figure 1



## **Attachment 1**

### **FEEDBACK TO DOE PRIOR TO VIABILITY ASSESSMENT**

1. **FY 1996 Annual Progress Report (NUREG/CR-6513, No. 1)**
  - **Addresses each of the 10 KTIs**
  - **Scope of issue and subissues**
  - **Link to DOE's Waste Containment and Isolation Strategy**
  - **Accomplishments toward issue resolution**
2. **TSPA 95 interaction and agreements (June 1996)**
3. **Seismic design methods interaction and agreements (July 1996)**
4. **TSPA 95 comment letter (November 1996)**
5. **Igneous activity interaction and agreements (April 1997 interaction and June 1997 agreement letter)**
6. **TSPA VA interactions and agreements (July 1997, November 1997, and March 1998)**
7. **Thermal-hydrological testing and analyses comment letter (January 1997)**
8. **Eight Issue Resolution Status Reports (IRSRs), Rev. 0 (1 in October 1997, 4 in November 1997, 2 in March 1998, and 1 in May 1998)**
9. **TSPA-VA comment letter ( July 6, 1998)**

## **Attachment 2**

### **Guidance on preparation for TSPA Technical Exchange**

- **Purpose of the Technical Exchange**
  - **To provide early feedback to DOE on potentially significant performance assessment vulnerabilities for DOE's consideration in preparing its TSPA-VA**
    - \* **Comment on DOE's TSPA-VA Plan**
    - \* **Identify concerns on DOE's TSPA-VA abstractions based on NRC staff's observation of the abstraction workshops**
  - **Discussion results will be factored into the IRSR on Model Abstraction in TSPA**
  
- **Material that should be reviewed**
  - **Summary of the previous technical exchange**
  - **TSPA-VA plan (Rev.00, dated September 13, 1996)**
  - **DOE's abstraction workshop summary document,**
  - **DOE's expert elicitation workshop summary documents**
  - **Major comments on prior DOE's TSPAs**
  - **Insights gained from running the TPA code**
  
- **Needed Support from all KTIs**

**After reviewing the applicable items in the above list, all KTIs should provide view graphs (2-3 pages) which identify and summarize major concerns on DOE's TSPA-VA approach.**

**All presentation material will be reviewed by the Management Board before being finalized.**