October 9, 1999

Mr. Dwight Shelor, Acting Director
Program Management and Administration
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

SUBJECT: SUMMARY OF TOTAL SYSTEM PERFORMANCE ASSESSMENTS FOR YUCCA MOUNTAIN TECHNICAL EXCHANGE, MAY 25 - 27, 1999

Dear Mr. Shelor:

Enclosed is the summary of the Total System Performance Assessments for the Yucca Mountain Technical Exchange, held May 25 - 27, 1999, between the staff of the U.S. Nuclear Regulatory Commission (NRC) and representatives of the U.S. Department of Energy (DOE). The summary consists of the meeting minutes, the agenda (Attachment 1), the list of attendees (Attachment 2), and the presentation materials (Attachments 3-39). This interaction was a video conference between NRC headquarters in Rockville, Maryland; DOE's office in Las Vegas, Nevada; and the Center for Nuclear Waste Regulatory Analyses in San Antonio, Texas. The meeting was also attended by representatives of the State of Nevada, Nye and Clark Counties, Nevada, DOE contractors, and NRC contractors.

If you have any questions regarding this letter, please contact Christiana Lui of my staff. She can be reached at (301) 415-6200.

Sincerely,

[Original signed by:]
C. William Reamer, Chief
High-Level Waste and Performance
Assessment Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated
cc: See attached list

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MINUTES OF THE MAY 25 - 27, 1999
U.S. DEPARTMENT OF ENERGY/U.S. NUCLEAR REGULATORY COMMISSION
TECHNICAL EXCHANGE ON TOTAL SYSTEM PERFORMANCE ASSESSMENTS
FOR YUCCA MOUNTAIN, NEVADA

Introduction

On May 25 - 27, 1999, U.S. Department of Energy (DOE) and U.S. Nuclear Regulatory Commission (NRC) staff conducted a Technical Exchange (TE) to discuss NRC staff's insight on Total System Performance Assessment supporting DOE's Viability Assessment (TSPA-VA), the framework for the Yucca Mountain Review Plan (YMRP), and planned DOE approaches for Site Recommendation and beyond. The detailed agenda for this three-day meeting can be found in **Attachment 1**.

The TE was held at the Center for Nuclear Waste Regulatory Analyses (CNWRA) in San Antonio, Texas. A three-way video conference connection between CNWRA, NRC headquarters in Rockville, Maryland, and DOE's office in Las Vegas, Nevada, permitted remote participation of additional DOE and NRC staff and other interested parties. Besides staff from DOE, NRC, the CNWRA and DOE's Management and Operating (M&O) and Management and Technical Support (MTS) contractors, representatives from the State of Nevada, and Clark and Nye Counties, Nevada also attended the meeting. Members from the U.S. Nuclear Waste Technical Review Board (NWTRB) and staff from the NRC's Advisory Committee on Nuclear Waste were present, as were representatives from Electric Power Research Institute (EPRI) and Nuclear Energy Institute. **Attachment 2** contains the composite list of attendees who attended the TE at one of the three video conference locations.

TUESDAY, MAY 25, 1999

Following Wesley Patrick's (CNWRA) welcoming remarks, DOE and NRC provided opening remarks. Mark Tynan (DOE) stated that this is a critical time for the Yucca Mountain Project. DOE is now focusing on the Site Recommendation (SR), with License Application (LA) following shortly after SR. DOE was looking forward to the interaction to facilitate the preparation of TSPA-SR and a docketable LA. E. Von Tiesenhousen from Clark County stated that he found the TSPA TEs have always been very informative. Keith McConnell (NRC) in his introduction (see **Attachment 3**) clarified the objectives and limitations of this TE. He also stated that the results of analysis using NRC's Total-system Performance Assessment (TPA) version 3.2 code are preliminary, and future refinements are expected. Analyses for periods beyond 10,000 years were performed to better understand the system behavior, estimate the sensitivity of parameters, and evaluate the models in the TPA code.

NRC and CNWRA staff presented results from TPA 3.2 analyses, insights on TSPA-VA, framework for the YMRP, and a brief discussion on the defense-in-depth philosophy in the

proposed 10 CFR Part 63 during the first half of this 3-day meeting. The format of NRC insights on TSPA-VA started with an overview presentation followed by discussion of selected topics in a technical area. DOE and M&O staff presented planned approaches for Site Recommendation and beyond during the second half of the 3-day meeting. The presentations are grouped by the technical areas as identified in underlined headings.

NRC Total-System Performance Assessment Code, Version 3.2 (TPA 3.2) Presentations

Attachment 4 T. McCartin (NRC), "TPA 3.2 Overview"
Attachment 5 S. Mohanty (CNWRA), "TPA 3.2 Total-System Results"
Attachment 6 R. Codell (NRC), "System-Level Sensitivity Results and Alternative Conceptual Models in TPA 3.2"

During this group of presentations, NRC provided an overview of the approaches in the TPA 3.2 code, described outputs from the TPA 3.2 code, and presented results of the sensitivity analyses. It was emphasized that use of a particular approach, model, or parameter by the NRC should not be construed as regulatory acceptance or endorsement. The results and specific numbers used in the code were just examples, and the NRC was not attempting to develop the licensing case for the DOE.

It was noted that although some of the approaches, e.g., dilution factors, used by NRC were different from those used by DOE, TPA 3.2 code is sufficiently flexible to effectively evaluate the DOE models. It was also noted that the different approaches being used by NRC, DOE, and EPRI provided similar outcomes.

Due to the minimal impacts on performance (in microrems), questions were raised regarding the need for further TPA model refinement. NRC indicated that additional work is needed to improve the rigor of analyses and implement a risk-informed and performance-based review approach. Since results of sensitivity studies pointed out the relative importance of subsystems and possible errors or weaknesses in analyses, NRC plans to use the insights gained from the sensitivity studies to concentrate on those areas that contribute most to risk.

NRC is working on documenting the results using the TPA 3.2 code. Results using the TPA 3.1.4 code have been published, and the TPA 3.1.4 code description would be published shortly in a NUREG report.

NRC Insights on Presentation of Performance Assessment (PA) Results

Attachment 7 J. Weldy (CNWRA), "NRC Insights on Presentation of PA Results"

During discussions on the topics of transparency and traceability, including areas where the VA could have been improved, it was pointed out that the ability to trace information between documents, and to know which parameters are important and require further investigation, is critical to ensure the correctness and understandability of DOE's analyses. It was also pointed out that TSPA-VA probably provides the right level of detail for a possible Yucca Mountain LA, but needs to add a discussion on what is important to performance. The presentations to follow provided an indication on whether TSPA-VA was sufficiently transparent and traceable, such that NRC was able to correctly interpret DOE's approach in its review.

NRC Insights on Design and Waste Package (WP) Failure

Attachment 8 S. Mohanty (CNWRA), "NRC Insights on Design and Waste Package Failure"
Attachment 9 N. Sridhar (CNWRA), "DOE and NRC Approaches to Model the Effects of Initial Failures of Containers"
Attachment 10 G. Cragnolino (CNWRA), "Waste Package Corrosion"

The objective of the NRC's review on WP performance was to evaluate the time of failure of WPs, the number of WPs degraded as a function of time, spatial distribution of degraded WPs in the repository, and the geometry of failure due to degradation. It was pointed out that some values presented might not have been appropriately applied in NRC's analyses (i.e., they might have been applied to stainless steel instead of Alloy C-22), and DOE offered to review NRC findings to determine how values were applied. The Issue Resolution Status Reports (IRSRs) are the appropriate documents to determine how and what values were used by NRC in the analysis. DOE indicated that it would like to have a chance to comment on NRC's findings before any significant differences become an issue in the IRSR and requested the schedule for IRSR Revision 2 production. DOE also indicated, and NRC agreed, that IRSRs and YMRP need to allow flexibility to accommodate design changes.

NRC Insights on Seepage and Release

Attachment 11 R. Codell (NRC), "NRC's Insights into Seepage and Release"
Attachment 12 T. Ahn (NRC), "Oxidative Release Models"
Attachment 13 W. Murphy (CNWRA), "Alternative Release Models"
Attachment 14 D. Hughson (CNWRA), "Near-Field Dripping and Thermal Models"

NRC compared the major differences between DOE and NRC models for seepage and release, presented selected results using the TPA code with TSPA-VA data and summarized the impact of the differences. Technical bases for the release models in TPA 3.2 were also presented. Since degradation of the drift might be an important factor for estimating dripping, the most recent work on the effect of irregularity on dripping was presented for discussion.

WEDNESDAY, MAY 26, 1999

NRC Insights on Natural System

Attachment 15 G. Wittmeyer (CNWRA), "NRC Insights on Treatment of the Natural System in TSPA-VA and Comparison with TPA 3.2"
Attachment 16 J. Winterle (CNWRA), "Groundwater Velocity in the Saturated Zone"
Attachment 17 D. Turner (CNWRA), "Geochemical Radionuclide Sorption Models for Total Performance Assessment 3.2"
Attachment 18 P. LaPlante (CNWRA), "NRC Insights on Dose Conversion Factors"

NRC compared the major differences between DOE and NRC models for infiltration and deep percolation, unsaturated zone flow and transport, saturated zone (SZ) flow and transport, and borehole dilution. Selected results using the TPA code with TSPA-VA data were presented,

and the impact on performance was summarized. Technical bases for flow porosity in the SZ and geochemical sorption were discussed.

Similarities and differences in the dose conversion factors approach were described. It was noted that confirmatory calculations produce good agreements for the base case. Some differences might be due to use of default values in GENII-S. NRC noted that documentation for some important parameters and modeling choices was missing from the VA and its supporting documents and emphasized that the analyses must be adequately supported and transparent. Although it was agreed that transparency needs to be improved, the need to refine models was questioned, considering there were only microrem differences in the results. NRC stated that although doses from both the DOE and the NRC were low and the differences were small, inconsistent assumptions and data might have been used. NRC needs to understand the rationale for agreement. Bounding calculations also need to be supported by adequate technical basis.

NRC Insights on Disruptive Events and Processes

Attachment 19 J. Firth (NRC), "Disruptive Events"
Attachment 20 B. Hill (CNWRA), "Paths Forward on Igneous Activity Risk Assessments for Yucca Mountain"
Attachment 21 S. Hsiung (CNWRA), "Rockfall Abstraction Models"

NRC summarized its and DOE's modeling approach for disruptive events and processes and compared the major assumptions, parameter values and results. Current status and paths forward in igneous activity were presented for discussion. The approaches for treating rockfall were summarized and compared. NRC also pointed out a possible error in the damage level calculation in the TSPA-VA.

Yucca Mountain Review Plan and Defense-in-Depth

Attachment 22 NRC Fiscal Year (FY) 1999 IRSR Completion and Distribution Schedule (K. McConnell, NRC)
Attachment 23 C. Lui (NRC), "Framework for the Yucca Mountain Review Plan"
Attachment 24 T. McCartin (NRC), "Defense-in-Depth Philosophy in Proposed Regulations for High-Level Waste (HLW) Disposal at Yucca Mountain"

In response to some of the IRSR questions raised during the previous day, NRC clarified that insights gained from the TPA analyses would be factored into the issue resolution process as practicable, i.e., without impacting the established FY1999 IRSR production schedule. The FY1999 IRSR completion and distribution schedule was provided to the meeting participants.

NRC presented the concept behind the development of the YMRP, including the relationship of the YMRP contents to the content of 10 CFR Part 63. Portions of §63.21 will be rearranged, consolidated, or moved to Subpart E. NRC does not intend to issue a separate format and content regulatory guide for the Safety Analysis Report, and plans to give a sufficient level of information in the YMRP to address format and content. The framework of YMRP is designed to provide sufficient flexibility to accommodate uncertainties in the regulatory process. NRC also stated that all acceptance criteria and review methods currently contained in the IRSRs

would be moved into the YMRP starting in FY2000. However, the status of issue resolution will continue to be documented in the IRSRs. It was noted that the risk-informed and performance-based integrated approach adopted in the YMRP would enable NRC to identify those potentially overly prescriptive acceptance criteria currently in the IRSRs. Those acceptance criteria will be appropriately modified for the YMRP. NRC would welcome feedback from DOE and any other interested parties on the IRSRs on a timely basis.

NRC discussed the definition of Defense in Depth (DID), postclosure repository performance objectives, Part 63 requirements for multiple barriers, and the use of quantitative approaches, emphasizing that NRC is not prescribing a specific approach. Barriers were not considered totally redundant, nor was there any specification of independence of barriers. Questions on the meaning of "sufficiency" of data would be judged in the context of the total system performance and specified in the YMRP. The Statement of Consideration of Part 63 will be reviewed to address the issue of potential common-mode failure of the barriers.

DOE Path Forward

Attachment 25 L. Rickertsen (M&O), "VA Results from Importance (DID) Analysis"

DOE addressed the potential issues identified by NRC previously, including: (1) potential differences in concepts for neutralization and importance analysis; (2) potential differences in how TSPA codes and models are used to represent the system; and, (3) the desirability of resolving issues with importance analysis well in advance of licensing. Key differences between the DOE and NRC codes were discussed.

Attachment 26 R. Howard (M&O), "Reference Design for Site Recommendation"

DOE reviewed the site recommendation reference design including thermal goals, rationale, design features, mass loading and footprint design, drift layout, WP design, and thermal management. Dan Bullen (NWTRB) asked whether cladding credit was taken and, if not, if any other credit was taken instead. DOE noted that many options were still being considered. DOE also indicated that once selected, the SR design is unlikely to change drastically for the LA, because of the short time span between SR and LA.

DOE Strategy for the Postclosure Safety Case

Attachment 27 A. VanLuik (DOE), "Overview of DOE's Strategy for the Postclosure Safety Case"
Attachment 28 D. Richardson (M&O), "Implementing DOE's Strategy for the Postclosure Safety Case"
Attachment 29 M. Lugo (M&O), "Process Models Reports (PMRs)"
Attachment 30 L. Rickertsen (M&O), "Implementing the DOE Strategy - the Path Forward"

DOE described the steps needed to complete the postclosure safety case. Various design options were still being considered. Because the design is changing, the principal factors for the safety case will also change, although the attributes of the Repository Safety Strategy will stay the same. Because of the long projected WP lifetime, ranking of the principal factors will mostly be based on 100,000-year calculations. DOE will use 9 PMRs to document the technical

basis supporting each TSPA process model, and presented the roles and responsibilities for PMR development. Level of the technical support information will be commensurate with the level of importance to performance. NRC raised questions regarding integration of the PMRs. DOE responded that integrated teams had been assembled and that the final product would be transparent.

THURSDAY, MAY 27, 1999

DOE Presentations

Attachment 31 A. VanLuik (DOE), "Overview of Major Site Recommendations, Environmental Impact Statements, and License Application Milestones and Schedule"

DOE presented a general overview of major programmatic milestones for Site Recommendation, Environmental Impact Statement (EIS), and License Application (LA), and noted that primary information feeds to TSPA-SR Rev. 00 must take place by August 1999. DOE also indicated that the results of the drift-scale heater test will be available during performance confirmation.

Attachment 32 R. Andrews (M&O), "Overview of Total Systems Performance Assessment-Site Recommendation (TSPA-SR) and Total Systems Performance Assessment-License Application (TSPA-LA) Strategy"

DOE provided an overview of the major TSPA-SR drivers, the philosophy and scope of TSPA-SR iterations, and the TSPA-SR schedule. It was noted that PMRs would be fully qualified or would be labeled as "TBVs" (To Be Verified) for the SR.

Attachment 33 H. Dockery (SNL), "DOE Response to NRC's Total System Performance Assessment and Integration Issue Resolution Status Report"

DOE provided a brief overview of the purpose, scope, and format of Total System Performance Assessment and Integration (TSPAI) IRSR, and provided specific comments on the report. Apparent inconsistencies in language between the IRSR and Part 63, with respect to descriptions of "features, events, and processes," were discussed. NRC stated that the terms and phrases were used intentionally. DOE suggested additional explanation might be warranted in order to avoid confusion.

Attachment 34 J. McNeish (M&O), "TSPA-SR: Methods/Assumptions Overview"

DOE's TSPA-SR Methods and Assumptions document strategy was discussed, including defining the IRSR linkage, the analysis approach, and the types of results. The IRSR Acceptance Criteria Database that tracks resolution status and activities for DOE was described. NRC pointed out that DOE would need to be aware of changes in NRC 's treatment of acceptance criteria to reflect the risk-informed and performance-based approach for the YMRP. NRC also pointed out that the key technical issues (KTIs) will continue to exist, but the

existing acceptance criteria and review methods under the KTI subissues in the IRSRs will be subsumed into the integrated subissue structure in the YMRP starting FY2000.

Attachment 35 G. Freeze (M&O), "Current Status of Feature, Event, and Process (FEPs) Screening and Scenario Selection for the Total System Performance Assessment-Site Recommendation"

An overview of scenario development and screening FEPs was provided, including a description of the FEPs database. The criteria for screening are on both probability and consequence, and FEPs may also be categorically excluded or screened out. NRC questioned how uncertainty is accounted for in the screening process. DOE replied that as many FEPs were being included as possible in order to have a defensible argument. J. Kessler of EPRI stressed that DOE needs to do a good job on documenting the FEP selection and screening process and consider combination of FEPs that might have an impact on performance. Regarding the issue of criticality, it is expected that the ongoing technical work would allow DOE to screen out far-field criticality based on low probability and in-package criticality based on a low consequence argument for the proposed compliance time period of 10,000 years.

Attachment 36 M. Wilson (SNL), "Natural-System Models for Total System Performance Assessment-Site Recommendation"

DOE described changes in the natural system models from TSPA-VA to TSPA-SR. In anticipation to address groundwater protection, DOE has implemented a module in the RIP code capable of outputting concentration at various locations.

Attachment 37 S. D. Sevougian (M&O), "Treatment of Engineered Barriers in TSPA-SR"

DOE described changes in the engineered barrier system models from TSPA-VA to TSPA-SR. NRC asked if DOE would model early WP failures (considering the high number of manufactured products). DOE replied that if early WP failures were modeled, this would still be a very low number. NRC indicated that DOE needs to rigorously defend its treatment of early WP failure in future TSPAs. DOE agreed and stated this is being done. DOE also indicated that testing on the drip shield is currently ongoing at Lawrence Livermore National Laboratory.

Attachment 38 V. Vallikat (M&O), "Control and Traceability of Analyses"

DOE laid out a process to keep the PA analyses transparent, traceable and manageable. The supporting information (data and models) for TSPA, including quality assurance (QA) status, will reside in the Technical Database Management System (TDMS). Improvements are being introduced to the RIP code to enhance its capabilities and facilitate a better user interface.

Attachment 39 J. McNeish (M&O), "Human Intrusion Analyses for Future TSPAs"

DOE presented 3 possible scenarios to meet the human intrusion requirements in the proposed 10 CFR Part 63 for comment. NRC encouraged DOE, and any other interested parties, to submit comments during the public comment period. Clark County commented that the three scenarios proposed by DOE are not mutually exclusive.

Feedback

After the completion of the presentations and a caucus period, the meeting resumed. The NRC provided the following comments:

1. NRC viewed DOE's institutional awareness of nuclear culture, such as devising and vigorously implementing a QA program, as a very positive step towards producing a high quality license application.

2. TSPA-VA was a significant improvement over the previous TSPAs and has made progress towards producing a transparent and traceable set of documents. Future TSPAs should continue on improving the transparency and traceability.

3. DOE's attempt to explicitly address acceptance criteria in the IRSRs would facilitate NRC's review of DOE's products.

4. DOE should reach closure on design as quickly as possible and keep NRC informed to facilitate the development of a NRC review strategy.

5. It was not clear how much information will be available at SR and LA, respectively. It was also not clear what information DOE intends to collect during the performance confirmation period.

6. NRC is moving towards an integrated approach for YMRP. DOE's approach on PMRs and AMRs seemed to be moving in the opposite direction.

7. How NRC judges sufficiency will be in the YMRP. It will be risk-informed and performance-based.

8. Regarding human intrusion, DOE and all other parties were encouraged to submit comments on all aspects of the proposed Part 63.

9. In addition to the insights highlighted during this TE, more VA comments of lesser significance would be in NRC's Rev. 2 IRSRs.

After NRC, DOE offered the following comments:

1. TSPA interactions have always been very useful. They are the most successful DOE/NRC interactions.

2. Insights gained on using the TPA code to model the TSPA-VA were helpful in understanding the similarities and differences.

3. DOE appreciated that NRC viewed TSPA-VA positively and has noted areas where improvements are needed. DOE also understood that it will need to provide a technical basis adequate to support the safety case.

4. DOE viewed the re-evaluation of acceptance criteria and IRSRs, in the context of TSPA, as a very positive development.

5. The PMRs were designed to provide traceability. DOE will make sure the use of PMRs does not lead to disintegration.

6. DOE was interested in finding out NRC's plan on the TPA results and TSPA-VA comparison. DOE thought that spending resources documenting the comparison is not productive, because DOE has moved forward and is in the process of significantly revising some of the approaches, e.g., design, taken in VA.

7. DOE's safety case will likely evolve, as more work is done for SR and LA.

8. DOE was encouraged by NRC's risk-informed and performance-based regulatory approach. However, DOE was unclear whether this approach would be applied to all issues, especially those resulting in changes in the microrem dose range.

9. Because the series of interactions led to receiving timely feedback and an efficient review of TSPA-VA, DOE proposed to hold interactions with NRC to discuss the work supporting the SR at each key stage during the preparation for the SR.

Closing Remarks

Throughout the TE, NRC stressed that VA is not a licensing document, and comments, presentations, and observations on the VA do not necessarily apply to licensing. DOE is responsible for developing a licensing case that will stand on its own merits. NRC is responsible for reviewing the licensing case and determining its acceptability. DOE emphasized that it pays attention to the IRSRs and is encouraged to see NRC moving towards a risk-informed and performance-based integrated approach. Stability of the YMRP will be beneficial to the program and provide further guidance on a potential LA in 2002.

NRC noted on several occasions that the design should be finalized as soon as possible so that NRC can focus its review and DOE can develop better technical bases. It was noted that there is still uncertainty regarding final DOE WP designs and other EBS features, as well as material selection for containers. It was also noted that better technical bases were needed for DOE's approaches to modeling the effects of initial failures of containers and NRC's evaluation. A decision on the final design is expected at the end of June 1999. DOE indicated that the NRC will receive a copy of the report documenting this decision when it becomes available.

NRC was concerned about traceability of information. Several presentations alluded to the difficulty of determining where information or values were derived or how they were used in calculations. A "road map" is needed to trace information between TSPA-related documents and to know which parameters are important and which parameters were used in calculations. This information should be a part of the TSPA documentation and should be readily available for reviewers. In particular, NRC expressed concern regarding whether the PMRs would be effectively integrated and the integration would be transparent. In addition, NRC was concerned that the use of PMRs would actually "disaggregate" rather than integrate DOE's

safety case. DOE offered to discuss and clarify the content and intent of the PMRs in more detail during the planned interaction on YMRP.

It appeared that in some areas, NRC might have misinterpreted the approaches in TSPA-VA. DOE indicated that it intends to thoroughly review Revision 2 of the IRSRs and the results of the TPA calculations to ensure the correct values were used. The results of the reviews should be documented and transmitted to the NRC so that NRC can make any modifications necessary in the next iteration of IRSRs.

Regarding documenting the results of its TSPA-VA review, NRC indicated that though DOE has moved forward, it was necessary for NRC to document the basis for its comments and decisions.

In addition to the interaction on YMRP, several potential topics for future meetings were discussed, including an interaction to discuss FEPs and a demonstration of the TDMS.

The representative from Clark County offered the following comments: (1) he found the TSPA interactions have always been very informative; (2) he hoped DOE would keep up with the vigilance on QA; and (3) DOE would need to provide a detailed technical basis for juvenile failure of WPs.

The representative from Nye County offered the following comments: (1) DOE should appropriately consider and address repository ventilation in its design process; (2) DOE should include a QA person from day one in the development of PMRs; and (3) DOE needs to be more responsive to the affected units of local government. He further indicated that attending DOE/NRC interactions at CNWRA was not a burden.

There was no closing remark from the State of Nevada.

The meeting adjourned at 5:30pm.

Minutes approved by:

9/15/99

Christiana H. Lui, U.S. Nuclear Regulatory Commission,
High-Level Waste and Performance Assessment Branch

Date

9/15/99

Abraham Van Luik, Department of Energy,
YMP Senior Policy Advisor

Date

DOE/NRC Technical Exchange on
Total System Performance Assessments (TSPA) for Yucca Mountain

May 25 - 27, 1999
8:30am - 6:00pm (CDT)

Locations:
Center for Nuclear Waste Regulatory Analyses
6220 Culebra Road, Building 189
San Antonio, Texas

DOE Summerlin I Facility (videoconference room)
Blue Room on May 25, 1999
Atrium Room on May 26, 1999
LV625 on May 27, 1999
1551 Hillshire Drive
North Las Vegas, Nevada

NRC Headquarters - Two White Flint North
11555 Rockville Pike, Room T-2B5 (videoconference room)
Rockville, Maryland

TUESDAY, MAY 25, 1999

8:30am	Opening Remarks	DOE, NRC, NV and AUG
8:45am	Introduction	DOE, NRC
9:00am	TPA 3.2 Overview NRC Total System Results Discussion	McCartin (NRC) Mohanty (CNWRA) All
10:35am	**Break**	
10:55am	NRC Sensitivity Studies Results and Alternative Conceptual Models Discussions	Codell (NRC) All
12:15pm	**Lunch**	
1:25pm	NRC Insights on Presentation of PA Results Discussion	Weldy (CNWRA) All

Attachment 1

2:00pm	NRC Insights on Design and WP Failure	Mohanty (CNWRA)
	– Initial Failure	Sridhar (CNWRA)
	– Corrosion	Cragnolino (CNWRA)
	Discussion	All
3:40pm	**Break**	
4:00pm	NRC Insights on Seepage and Release	Codell (NRC)
	– Oxidative Release Models	Ahn (NRC)
	– Alternative Release Models	Murphy (CNWRA)
	– Near-Field Dripping and Thermal Models	Hughson (CNWRA)
	Discussion	All
5:40pm	Observer Comments	
6:00pm	End of Day One	

WEDNESDAY, MAY 26, 1999

8:15am	NRC Insights on Natural System	Wittmeyer (CNWRA)
	– Groundwater Velocity in the Saturated Zone	Winterle (CNWRA)
	– Sorption Models for TPA 3.2	Turner (CNWRA)
	– Dose Conversion Factors	LaPlante (CNWRA)
	Discussion	All
9:55am	**Break**	
10:15am	NRC Insights on Disruptive Events and Processes	Firth (NRC)
	– Igneous Activity Risk Assessments	Hill (CNWRA)
	– Rockfall Abstraction Models	Hsiung (CNWRA)
	Discussion	All
11:30am	**Lunch**	
12:40pm	Framework for the Yucca Mountain Review Plan	Lui (NRC)
	Discussion	
1:40pm	Defense-in-Depth Philosophy in Proposed Regulations for HLW Disposal at Yucca Mountain	McCartin (NRC)
	Discussion	
2:30pm	**Break**	
2:50pm	Results from Importance Analysis	Rickertsen (M&O)
	Discussion	

3:50pm	Reference Design for Site Recommendation	Howard (M&O)
4:20pm	DOE Strategy	
	– Overview of the Strategy	VanLuik (DOE)
	– Implementation of the Strategy	Richardson (M&O)
	– Overview of the PMR Concept	Lugo (M&O)
	– Path Forward	Rickertsen (M&O)
5:40pm	Observer Comments	
6:00pm	End of Day Two	

THURSDAY, MAY 27, 1999

8:30am	Overview of Major SR, EIS, and LA Milestones and Schedule	VanLuik (DOE)
8:50am	Overview of TSPA-SR and TSPA-LA Strategy	Andrews (M&O)
9:35am	YMP Response to NRC's TSPAI IRSR	Dockery (SNL)
10:05am	**Break**	
10:25am	TSPA-SR: Methods/Assumptions Overview	McNeish (M&O)
11:10am	Current Status of FEP Screening and Scenario Selection for TSPA-SR	Freeze (M&O)
11:45am	**Lunch**	
12:55pm	VA Modifications/Planned Updates	
	– Natural System Models for TSPA-SR	Wilson (M&O)
	– Treatment of Engineered System in SR	Sevougian (M&O)
2:25pm	Controlled Analyses/Traceability	Vallikat (M&O)
	– RIP Code Improvements	
2:55pm	Human Intrusion	McNeish (M&O)
3:25pm	Caucus	
4:30pm	Feedback	DOE, NRC
5:00pm	Closing Remarks	DOE, NRC, NV and AUG
5:30pm	Adjourn	

LIST OF ATTENDEES
AT THE DOE/NRC TECHNICAL EXCHANGE
ON TOTAL SYSTEM PERFORMANCE ASSESSMENTS
FOR YUCCA MOUNTAIN, NEVADA

May 25 - 27, 1999

Advisory Committee on Nuclear Waste (ACNW)
A. Campbell

Center for Nuclear Waste Regulatory Analyses

S. Brossia	L. Browning	A. Chowdhury	G. Cragnolino	S. Hsiung
R. Janetzke	P. LaPlante	P. Mackin	L. McKague	M. Miklas
S. Mohanty	W. Murphy	R. Pabalan	W. Patrick	O. Pensado
B. Sagar	D. Sims	N. Sridhar	J. Weldy	J. Winterle
G. Wittmeyer				

Clark County, Nevada
E. von Tiesenhausen

Electric Power Research Institute (EPRI)
J. Kessler

Naval Reactors
J. Smyder

Nuclear Energy Institute
R. McCullum

Nye County, Nevada
N. Stellavato

Sandia National Laboratories

B. Arnold	R. Baca	H. Dockery	J. Gauthier	K. Gaither
C. Ho	M. Itamura	R. MacKinnon	R. Rechard	M. Wilson

State of Nevada

L. Lehman	S. Zimmerman

U.S. Department of Energy (DOE)

A. Gil	S. Hanauer	M. Tynan	A. Van Luik	A. Wikjord

DOE Management and Operating (M&O) Contractor

R. Andrews	G. Freeze	P. Gaillard	J. Houseworth	R. Howard
J. Lee	M. Lugo	S. Mishra	J. McNeish	D. Richardson
L. Rickertsen	W. Robinette	G. Saulnier	D. Sevougian	A. J. Smith
M. Scott	V. Vallikat			

Attachment 2

DOE Management and Technical Support (MTS) Contractor

R. Gamble	B. Mukhopadhyay	W. M. Nutt	J. York	E. Zwahlen

U.S. Nuclear Regulatory Commission

T. Ahn	J. Bradbury	D. Brooks	K. Chang	J. Ciocco
R. Codell	W. Dam	N. Eisenberg	J. Firth	C. Greene
J. Greeves	L. Hamdan	A. Ibrahim	R. Johnson	B. Leslie
C. Lui	T. McCartin	K. McConnell	M. Rahimi	C. W. Reamer
J. Trapp	S. Wastler			

U.S. Nuclear Waste Technical Review Board (NWTRB)

D. Bullen	L. Reiter	J. Wong

Winston & Strawn

S. Echols