

PROJECT WM-11/SMC/83/04/13/2

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PROJECT WM-11

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MEMORANDUM FOR: Hubert J. Miller, Chief
High-Level Waste Technical
Development Branch
Division of Waste Management

FROM: Seth M. Coplan
High-Level Waste Technical
Development Branch
Division of Waste Management

SUBJECT: REPOSITORY DESIGN WORKSHOP SUMMARY

Attached is the summary of the NRC-DOE Repository Design Workshop. The workshop was held on January 24-25, 1983 at Sandia National Laboratory and was followed by a visit to the Yucca Mountain site on January 26, 1983. The dual purpose of the workshop was to identify issues and to consult on what would be acceptable methods and approaches for issue resolution.

WM Record File

WM Project 11
Docket No.

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Seth M. Coplan
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Division of Waste Management

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Attachment:
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CLOSEOUT COMMENTS OF NRC AND DOE ON THE CONCEPTUAL DESIGN WORKSHOP
SANDIA NATIONAL LABORATORIES
January 24-25, 1983

The following are points raised by NRC.

Observations

1. The discussion regarding the possible use of an incline rather than a vertical shaft as access to the repository did not reveal any specific factors that could represent latent problems. NRC perceived that use of an incline might provide several advantages.
2. The approach to the development of an in situ test plan for Yucca Mountain, i.e., the use of G-tunnel, with similar rock type and stress regime, for development of methodology is technically reasonable.
3. The use of a variety of assumptions about the geologic setting and different data sets in design and analysis is a potential source of confusion in the SCR. NRC thought that it would be prudent to either establish a reference set of assumptions and a reference data set or clearly state the assumptions and data that were used in each particular facet of design or analysis and explain why the use of different data and assumptions do not materially affect the overall design.
4. Horizontal emplacement of waste packages, as proposed by Sandia, has obvious and significant economic and operational advantages. However, questions regarding borehole stability, compatibility with backfill emplacement, and assurance of retrievability are such that NRC is concerned about whether adequate confidence can be developed in this scheme prior to a license application without some level of demonstration.

Items for Further Discussion

1. The technical basis on which the engineered systems performance objectives will be met.
2. The proposed physical and phenomenological models that will be used in the analysis and design of the repository in the unsaturated zone of Yucca Mountain.
3. The philosophy and technical approach to be used in specifying and developing borehole and shaft seals for a repository in the unsaturated zone at Yucca Mountain.

4. The philosophy, logic, and proposals for an approach of comingling of waste (commercial high level, defense high level, commercial spent fuel, and commercial TRU) in a repository in unsaturated tuff.

Information Requested

Viewgraphs

1. Preliminary Repository Layouts and Elevations, Showing Incline
2. Waste Emplacement Configurations
3. Temperature Buildup in Drifts for Vertical and Horizontal Emplacement Scenarios
4. Repository Sealing Elements and Approach Used
5. Waste Emplacement Factors
6. NNWSI-RSP Elements
7. Comparison of Tuff Properties and Average Properties, by Zones
8. Conceptual Pictures of Drilling and Overcoring Equipment for Emplacement Holes
9. Tuff Concrete Studies and Properties
10. Confined and Unconfined Thermal Expansion Data
11. Heated Block Experiment
12. Projected Variations in Stress with Depth (2 View Graphs - Hustrulid)
13. Pillar Factors of Safety
14. Global Average Safety Factors Around Openings
15. Table Showing Temperature Buildup and Heat Removal Requirements for Various Emplacement Scenarios
16. Summary Table on Hydrothermal Analysis
17. Statistics on Various Mechanical Miners
18. Thermal Conductivity of Tuff and Remaining Work on Thermal Properties
19. Thermal Expansion
20. G-Tunnel Field Experiments, In-Situ Stress, Summary of Results
21. Stability of Openings: Repository Spatial Relations, Technical Constraints, Summary of Results
22. Rock Mass Classification
23. Waste Emplacement - Specific Conditions
24. Shaft Statistics - Mt. Taylor and Yucca Mountain
25. Shaft Lining Stability at Mr. Taylor

Other Information

- Geologic Logs for GU-3 and G-4 Coreholes
- Seisviewer Coreholes Data for G2, GU3, and G-4
- List of Design or Geoengineering Codes That Will be Used by NNWSI Project in the Analysis of the Repository

The following are the points raised by DOE.

Observations

1. The workshop provided SNL technical staff supporting the NNWSI Project with a good understanding of the questions important in a regulatory arena and the requirements necessary to address issues of importance.
2. The workshop provided good insight into the logic of NRC personnel with regard to how they will review information important to licensing.
3. The meeting was conducted in a professional and open manner which facilitated an efficient and constructive discussion of design basis and design philosophy.

Items for Discussion at Future Meetings

1. The basis on which stability of underground openings will affect the protection of health and safety for a radiological hazard.
2. The aspects of design NRC expects to review as part of the license review.
3. The sampling procedures needed to assure NRC that samples taken for the purpose of mechanical testing are representative of the geologic media.

Information Requested

None

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DATA EXAMINED DURING
DOE-NRC DESIGN WORKSHOP
JANUARY 24-25, 1983

1. Rock thermal conductivities
2. Rock compressive strengths
3. Rock shear strengths
4. Rock densities
5. Rock porosities
6. Rock moisture contents
7. Stress data
8. Rock deformations
9. Ground motions (accelerations, velocities and displacements)
resulting from weapons tests

REVISED AGENDA

NRC BRIEFING ON REPOSITORY DESIGN

January 24, 25, 1983
Bldg. 823, Room 2468

JANUARY 24

8:15	Introduction DOE	Don Vieth
8:30	Introduction NRC	Seth Coplan
8:45	Design Concepts	Leo Scully
	o Underground Layout	
	o Plan & Elevation	
	o Sloping Beds	
	o Shaft <u>vs.</u> Decline	
10:00	BREAK	
10:15	o Waste Emplacement Concepts	
	Horizontal <u>vs.</u> Vertical	
	Co-mingling of Waste	
	Gross Thermal Loading	
	o Waste Emplacement Equipment	
11:20	Repository Sealing Concepts	Joe Fernandez
12:00	LUNCH	
1:00	Mechanical-Thermal Data	Joe Tillerson
	o Laboratory Testing	
	o G-Tunnel Testing	
	o Exploratory Shaft Testing	
3:15	BREAK	
3:30	Stability of Openings	Lynn Tyler
	o Horizon Selection	Keith Johnstone
	o Rock Mass Classification	Paul Gnirk
5:00	ADJOURN	

JANUARY 25

8:15	Stability of Openings (Con't)	Leo Scully
	o Effects of In-Situ Stress	Bill Hustrulid
	o Shaft Stability	Bill Hustrulid
	o Effects of Drill & Blast <u>vs.</u> Mechanical Mining	Bill Hustrulid
10:00	BREAK	
10:15	Analysis Supporting the Waste Emplacement Configuration Study	
	o Heat Transfer/Thermal Histories	Jace Nunziato
	o Thermal-Structural/Stress <u>vs.</u> Strength Profiles	Bill Sullivan
	o Ventilation/Heat Removal	Jace Nunziato
	o Fluid Migration	Jace Nunziato
12:00	LUNCH	
1:00	Design Basis Ground Motion	Luke Vortman
	o Field Measurements	
	o Data Analysis	
	o Prediction Equations	
2:30	NRC Private Discussion	Seth Coplan
3:30	NRC Feedback Comments	Seth Coplan
5:00	ADJOURN	

ATTENDEES

NRC/DOE/SNL ENGINEERING REVIEW January 24, 1983

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