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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: NRC/DOE Technical: (i) Meeting on ESF Design and Construction Update, and (ii) Exchange on Field Heater Experiments Associated with Coupled THMC Processes (Account Nos. 20-5702-623, -641, -642; 20-5704-023, -039)

DATE AND PLACE: November 7-9, 1994, Las Vegas and Yucca Mountain site, NV

AUTHORS: A. Ghosh, R.D. Manteufel, A.H. Chowdhury, S. Mohanty, and R.T. Green

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PERSONS PRESENT: Appendix A provides the list of 44 participants at the NRC/DOE Technical Meeting on ESF Update on November 7, 1994. The list of 39 participants at the NRC/DOE Technical Exchange on Field Heater Experiments Associated with Coupled Thermal-Hydrological-Mechanical-Chemical (THMC) Processes on November 9, 1994 is given in Appendix B. In addition, about 45 people visited the ESF North Ramp Construction site and the Field Heater Experiments site at Yucca Mountain on November 8, 1994.

BACKGROUND AND PURPOSE OF TRIP:

The Civilian Radioactive Waste Management System Management & Operating Contractor (M&O) performed the 90% management and technical design review of the Exploratory Studies Facility (ESF) Title II Design: Package 2C—Topopah Spring North Ramp, in Las Vegas, Nevada on May 16-20, 1994. The Nuclear Regulatory Commission (NRC) and the Center for Nuclear Waste Regulatory Analyses (CNWRA) participated in the observation of this review. On August 10, 1994, the NRC submitted its Design Review Observation Report 94-02 to the Department of Energy (DOE). Since then several NRC/DOE technical meetings were held to discuss various aspects of the design of ESF Package 2C. Furthermore, since the last week of September, 1994 the DOE was conducting the Tunnel Boring Machine (TBM) excavation of the ESF North Ramp at the Yucca Mountain (YM) site based on the revised design of ESF Package 2C. The purpose of attending the NRC/DOE technical meeting on ESF (November 7, 1994) by the CNWRA staff, including the North Ramp construction site visit (November 8, 1994), is to gain technical insight on the revised version of ESF Package 2C design; on-site observation of North Ramp construction; and support NRC regarding NRC's comments on North Ramp design and construction and DOE's response to NRC comments.

The DOE has prepared at Fran Ridge in YM, a $3 \times 3 \times 4.5$ m rock block for THMC experiments called "Large Block Test (LBT)." These proposed coupled experiments along with the coupled laboratory experiments will provide an important component of DOE's activities on coupled processes. The CNWRA staff attended the NRC/DOE technical exchange on LBT associated with coupled THMC processes (November 9, 1994), including the LBT site visit (November 8, 1994), to gain knowledge about DOE's

plans, programs, and approach for activities relevant to coupled THMC processes, and to support NRC in presenting NRC's work on THMC processes.

SUMMARY OF PERTINENT POINTS:

NRC/DOE Technical Meeting on ESF Update:

The agenda for this meeting, which was held on November 7, 1994 in the Bank of America Building, Las Vegas, Nevada is given in Appendix C. This meeting was started at 1:00 pm with opening remarks by the representatives of DOE and NRC. J.M. Replogle, acting assisting manger, engineering and field operations provided a status report of the action items from previous NRC/DOE ESF meetings. He also discussed the requirements for access to Nevada Test Site and to ESF North Ramp tunnel. Completion of three types of training classes [e.g., General Employee Training (GET), General Employee Radiological Training (GERT), and General Underground Training (GUT)] are required for permanent access permit for unescorted access to ESF North Ramp tunnel except to the TBM operational area. Visitors with temporary access permit can enter the ESF North Ramp tunnel only when accompanied by an escort. There is also a limit on the maximum number of persons (visitors, TBM operators, and other workers inside the tunnel) allowed at one time inside the tunnel. This limit is currently about 25 persons and is based on the mine available rescue capability. He also talked about the ESF design and construction progress. This included a brief review of several ESF design packages including design package 8A—Topopah Spring Level Main Drift that will be completed in FY95, the construction of Main Drift based on package 8A design will start in FY96 and will be completed in FY97.

J. Holonich (NRC) provided NRC's response to DOE's letter of 3/30/94 and S. Brocoum, assistant manger, suitability and licensing provided status of DOE's response to NRC's letter of 10/13/94. He discussed the three questions that were raised by the NRC. He stated that most of the problems have been corrected and the others were being corrected. A. Segrest of M&O presented the management plan for resolving Quality Assurance issues on ESF Package 2C design. His discussions included status for Connective Action Request analysis, items corrected during recent audits/surveillances, design process review, classification process review, product quality review, culture review, and management plan closure.

J. Pye made a presentation on ESF North Ramp ground support system. He stated that the four permanent components of ESF, namely underground openings, shaft liners, operational seals, and ground support must be designed to have a maintainable life and quality as specified for the repository. This requirement is based on the DOE's assumption that portions of the ESF will eventually become part of the geologic repository. However, he acknowledged that since the repository design criteria such as seismic design criteria had not been defined yet, ESF Package 2C design did not satisfy all the design requirements of the repository. This inconsistency in ESF design will be taken care of through supplementary design. DOE has designed 5 categories of ground support systems for the ESF, category 1 being for the expected strongest rock and category 5 being for the weakest rock.

L. Morrison of M&O discussed the ESF Package 2C Basis for Design (BFD). He stated that the BFD for ESF Package 2C was replaced by two documents: Requirements Allocation Analysis and Design Input List. These two documents retain the functions of the BFD but are better suited to document the design bases and implementation of the design program. W. Boyle presented the status of the drilling, sampling, and testing activities that are being carried out at YM.

Visit to North Ramp construction site took place in the morning of November 8, 1994. However, the NRC/CNWRA staffs could enter the tunnel only up to about station 00+15m. Thus the site visit was limited primarily to the observation of the North Ramp Portal area. The rock at the Portal seemed quite fragmented.

NRC/DOE Technical Exchange on Field Heater Experiments Associated with Coupled THMC Processes:

This technical exchange that was held in the Bank of America Building, Las Vegas, Nevada on November 9, 1994, was preceeded by the LBT site visit at Fran Ridge on November 8, 1994.

The large block has been excavated in TSw2 unit. The size of the block is $3 \times 3 \times 4.5$ m. Rock around the block has been excavated up to a distance of about 7 m from each side of the block for carrying out the experiments. Due to budget constraints, the test is under hold at present. The block has been isolated and protected with several layers of plastic sheets. Four vertical rock bolts are holding the block in place. Analysis of results from LBT is now scheduled for completion in mid-FY97, however this date is subjected to revision with regards to future funding decisions. The LBT is neither expected to simulate the ESF or repository condition nor it is expected to replace Engineered Barrier System Field Test (EBSFT). Waste package emplacement modes are not expected to be tested in the LBT. Direct thermal loading issues are not expected to be resolved through LBT.

Specific goals for LBT are to:

1. determine dominant heat transfer mechanism
2. monitor dry-out zone, condensate refluxing and drainage, rewetting at the end of the boiling period
3. assess coupling of geomechanical and geochemical processes with thermo-hydrology.

Rock mass within the large block was not visible. The wall of the surrounding excavation showed that the rock mass is extremely blocky with average *in situ* block size of 2 to 4 inches. Larger *in situ* blocks are 10 to 12 inches. Some joints, especially at one side of the excavation, have significant calcite infilling. Small blocks up to 1 m in size have been taken from the excavated areas around the large block for laboratory testing.

Fractures visible on all five surfaces of the block have been mapped. The three dimensional plexiglass model of the block where the fractures have been marked up shows that the large block contains several major (several millimeters aperture) and minor (small aperture) fractures. Several major fractures are intersecting each other. The model also shows branching of a major fracture from another major fracture or termination of a major fracture into another major fracture. Some of the major fractures terminated abruptly in the intact rock. Minor fractures intersected these major fractures and created a dense fracture network. Many of the fractures may have calcite infilling. FRACMAN code was used to analyze the connected paths with fracture network in different realizations.

Five line heaters will be placed at a height of about one-third way up from the bottom of the block. Expected maximum temperature at the heater horizon is 135 to 140 °C. Four vertical sides of the large block will be insulated (zero flux condition). Top surface will be heated up to a temperature of 60 °C and will be kept at that constant temperature. Vapor will be collected and measured at the top. A constant pressure of 5 MPa will be applied to all five faces. A frame is under construction which will be used to apply the mechanical loading. No flow boundary conditions will be maintained at the sides. Water will be put over the top surface.

Characterization of the initial moisture distribution of the block was carried out using the cores from holes drilled before excavation. This was followed by neutron logging. The moisture content increased slightly after the sawing of the block. Neutron logging will be carried out again before heating the block. Every hole will be packed before the test begins.

Initial conditions of the large block will be measured for two weeks. The large block will be mechanically loaded and unloaded for several cycles for at least one week before heat is applied to gather information about cyclic mechanical responses. The block will be heated up and kept at the steady state condition for at least four months. Both mechanical and thermal-mechanical (TM) responses will be monitored as a function of both temperature and time. This phase will be followed by the cool-down period. Data acquisitions will continue during all these phases. At the end of the testing, the block will be over-cored and dismantled for post-test characterization. Thermal-mechanical-hydrological (TMH) responses to be monitored include dry-out zone, condensation zone, refluxing, and above original saturation of the matrix. On the chemical side, it is expected that silica minerals will precipitate very quickly in heated condition. This expectation is based on the tests conducted by the Sandia National Laboratories (SNL) on crushed tuff.

Properties measured in the laboratory using small blocks collected during preparation of the large block will be used to model the large block. Simulation results will be compared with the actual measurements to evaluate the adequacy of the models. Laboratory experiments using small blocks include determination of rock properties, and testing of TM, thermal-hydrological (TH), and thermal-chemical (TC) processes and models. Under TH, fracture flow vs. matrix imbibition, 1-D imbibition and drying, and condensation along fractures will be studied. Under TC, rock-water interaction and chemical processes in refluxing will be studied. Under TM, displacement in fractures, and thermal fracturing will be studied. In addition to the above, physical properties and responses such as, density, porosity, permeability, mineralogy, electrical conductivity vs. water saturation, stress-strain curves, etc. will be studied.

W. Lin mentioned that the recent budget restrictions had restricted the scope of the LBT. A potential reallocation of resources may resort in the elimination of the bottom 1.5 m of the loading frame. Instead of a loading frame, this part of the block will be instrumented then encased in a larger concrete pedestal. A horizontal load will not be able to be imposed on the lower 1.5 m of the block if the loading frame is replaced with concrete. Additionally, the five heaters may have to be raised above the currently designed horizon which is at the 1.5 m level. If the heaters are raised too much, formation of dry-out/condensate zone may need to be recalculated.

The LBT site visit at Fran Ridge on November 8, 1994 was followed by meeting on November 9, 1994 in the Bank of America Building in Las Vegas. This meeting was attended by 39 persons from DOE, M&O, State of Nevada, Nye county, Weston, Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratories (LLNL), NRC, CNWRA, and Nuclear Waste Technical Review Board. The agenda of this meeting is given in Appendix D. Following the opening remarks, the presentations were made both by NRC and DOE and their contractors/subcontractors.

M. Nataraja of NRC presented Regulatory Bases for Evaluating TMHC Processes. He discussed the Staff Technical Position (STP) on Thermal Load and the regulatory bases for evaluating TMHC processes. He presented the logic flow of an acceptable methodology for demonstrating compliance with 10 CFR 60.133(i). This was followed by a presentation by A.H. Chowdhury of CNWRA providing an overview of NRC/CNWRA activities on coupled THMC processes. He summarized the current activities on TMHC coupled processes at CNWRA and presented the following activities in more detail: review of TMHC literature, thermohydrology research project, DECOVALEX activities, and TM and TMH code evaluation.

A.M. Simmons, Geochemistry Team Leader presented DOE's Approach to Coupled TMHC Processes. She presented the logic flow chart of thermal STP for an acceptable methodology for demonstrating compliance with 10 CFR Part 60.133(i) and gave a ten point list based on the STP. She then discussed the iterative approach taken by DOE for the development of coupled TMHC models. Repository Advanced Conceptual Design considers two thermal regimes. There may be different coupling phenomena and may be different magnitudes/strengths of the coupled phenomena at these two thermal regimes. Modeling and testing will be carried out at various scales to ensure that appropriate level of details will be included in the analysis. There has to be a balance between the unworkable complexity and oversimplification of the processes. However, some uncertainty will remain. DOE will assess the effects of the uncertainties associated with model assumptions and will use conservative data and assumptions to compensate for these uncertainties. She stated that modeling of the coupling phenomena among the processes might require empirical approaches rather than mechanistic understanding of TMHC processes. Only significant coupled phenomena among the processes will be taken into account. If detailed understanding of coupled TMHC processes cannot be gained before the license application for construction authorization, DOE will develop models approximating coupled responses with overestimating unfavorable aspects and/or underestimating the favorable aspects of repository performance.

D.G. Wilder of LLNL presented the Testing Plans, Goals and Intended Use of Large Block Testing Results. The LLNL testing strategy includes both laboratory (0.5 m, hours to days) and block (3-5 m, months to yr) scales, as well as future *in situ* ESF scale tests (30 - 100 m, 1-3 yr). The purpose of the laboratory scale tests are for property measurement, and observation of matrix and single-fracture processes. The block scale tests are for observation of multiple-fracture processes and coupled processes. The ESF tests are for site characterization and observation of processes as anticipated in the repository. The repository scale (up to 600 m and 50-100 yr) is where performance confirmation testing of actual couplings will occur. The objectives of the LLNL tests include (i) identifying the processes to be included in mechanistic models, (ii) developing empirical models if mechanistic models are unavailable, (iii) building confidence in modeling ability, (iv) measuring rock mass properties, and (v) characterizing heterogeneties of the system to assist in model building. The important mechanisms between coupled processes will also be identified. A sequential approach to coupled processes is being pursued where two processes are initially considered (e.g., TM, TH, TC, HC) and higher order couplings are considered as needed (e.g., THM, THC). Full couplings may be unrealistic and unnecessary. The *in situ* heater tests will be structured to address fundamental hypotheses, including: (1) conditions where heat conduction dominates heat flow; (2) whether above-boiling temperatures remove all mobile liquid water; (3) whether fracture density and connectivity are sufficient for rock dry-out; (4) whether rewetting significantly lags the end of boiling; and (5) conditions where large-scale, buoyant, gas-phase convection may dominate. Long-range time schedules for testing plans were presented where the laboratory block tests, field LBT, North Ramp heater tests, and ESF *in situ* heater tests feed into the overall DOE YM program. The results from the laboratory block tests will be available for technical site suitability (TSS) in 1997, the LBT will be available for Waste Package Title 2 design ($\sim$ 1999) and License Application (LA) data input (2000), the North Ramp heater test will be available for the LA (2001) and license enhancement (through 2005), and the *in situ* ESF heater tests will be available for final LA data input (2007).

D.G. Wilder (LLNL) also discussed lessons learned from the Climax and G-Tunnel tests. The Climax tests were primarily TM and the G-Tunnel tests were primarily TH. Both tests were conducted in southern Nevada with Climax being in granite rock and G-Tunnel being in tuff (similar to YM tuff). The Climax tests were carried out in three mined drifts. Heaters were placed in each drift with the middle drift simulating underground repository conditions. The middle drift was heavily instrumented. Lessons learned from Climax were: (i) conduction was the dominant mechanism of heat transfer, (ii) use of

electrical heaters to simulate waste package was acceptable, (iii) geomechanical processes were strongly influenced by the presence of fractures, (iv) hydrology appeared to be influenced by stress orientation with respect to fracture geometries, (v) rock properties were not changed significantly by heating or radiation, (vi) overall response of the rock mass was inelastic due to opening of the fractures during cool down phase and (vii) it was important to monitor the long term cooldown phase of the test. It was noted that elastic models did not do a good job of predicting geomechanical responses in areas of intense fracturing, but were acceptable with adjustments in un-faulted but jointed rock (relatively massive rock mass). Lessons learned from G-tunnel tests were: (i) flow in fractures channelized, (ii) conduction dominate the heat transfer, (iii) dry out zone was facilitated by fractures, and (iv) adequate volume of rock mass is needed so as to include representative fractures in field testing.

The G-Tunnel test consisted of an electrical cartridge heater placed in a horizontal borehole. Measurements were obtained from two sides using pressure transducers, thermocouples, and neutron probes. Experimental observations were that fractures acted as conduits for vapor flow and rewetting occurred primarily along fractures. Measured temperatures were close to predictions, however slight variations were observed and attributed to fractures where boiling occurred. A question was asked where all of the detailed G-Tunnel measurement data was published because only highlights of the data were given in the published LLNL reports. D. Wilder stated that only highlights of the data were published in LLNL reports, however all of the data was transmitted to the DOE YM project office and could be requested though the local record center. The questioner then suggested that the reports summarizing the LBT include more "raw" data so that it would be readily available for analysis by interested parties. A question was also asked about the impact of ventilation on removing heat and moisture during the tests. D. Wilder stated that ventilation was minimized so that it did not disrupt the test, however some amount of heat and moisture was removed (they estimated 20 tonnes of groundwater was removed during the tests). He suggested that ventilation effects at YM need further study.

W. Lin of LLNL disucssed the Field Testing of the Coupled TMHC Processes. This presentation supplemented the discussion at the Fran Ridge site on previous day. Lin presented the update on the LBT experiment. He also emphasized that the purpose of the LBT is to improve understanding of the couple TMHC processes. It is not meant to be a prototype field test or *in-situ* field test. The LBT is expecte. to provide preliminary data. Various models for the coupled processes will be tested more extensively in the Engineered Barrier System Field Tests test. The main advantage of conducting such an experiment are: (i) the boundary conditions are controlled, (ii) the block can be characterized uniquely before and after the test and (iii) specimen size is quire large compared to laboratory scale so that large scale phenomena can be observed. The LBT is also expected to help in evaluating measurement methodology and instruments to be used in the EBSFT.

Presentations were also given by T. Buscheck of LLNL on Hydrologic Effects, W. Glassley of LLNL on Geochemical Effects, B. Robinson of LANL on Coupled Thermohydrologic—Geochemical Modeling. S. Blair of LLNL on Geomechanical Effects, and J. Pott of SNL on Field Experiments on Coupled TMHC Processes. These presentations covered the LBT objectives that were introduced by D.G. Wilder and W. Lin. Copies of handouts for all the presentations are available with the authors.

IMPRESSIONS/CONCLUSIONS:

None

PROBLEMS ENCOUNTERED:

None

PENDING ACTIONS:

None

RECOMMENDATIONS:

None

SIGNATURES:

A. Ghosh
Senior Research Engineer

Date

CONCURRENCE SIGNATURES AND DATE:

Asadul H. Chowdhury
Manager - RDCO

1/05/95
Date

Budhi Sagar
Technical Director

1/6/95
Date

APPENDIX A

List of Participants at the NRC/DOE Technical Meeting of ESF Update on November 7, 1994

NRC/DOE TECHNICAL MEETING
ON EXPLORATORY STUDIES FACILITY
NOVEMBER 7, 1994

	PRINT NAME	COMPANY	TITLE
1	NORMAN T. SIMMS	M&O/DUKE	REG. / LICENSING
2	WILLIAM BOYLE	DOE	Physical Scientist
3	Christian E. Einberg	DOE/HQ	General Engineer
4	Asadul H. Chowdhury	CNWRA	Manager - RDCO
5	MICHAEL BELL	NRC/DWM	CHIEF, ENG B
6	E.V. TIESENHAUSEN	CLARK COUNTY	ENG. SPEC.
7	NICK STELLAVATO	Nev Co.	ON Site Rep
8	MAL MURPHY	"	Reg + Licensing Advisor
9	HOMI MINWALLA	CUESTA	SI / Project Engr
10	Chris Henkel	NEI	Project Manager
11	Randall D. Manteufel	CNWRA	Research Engineer
12	Rex A Wescott	NRC	Sr. Hydrologist
13	Philip R. HAMMOND	M&O/Duke	REG / Licensing
14	Jerry L. Nuff	M&O/Mill	Dept Mgr Subsurface Design
15	DAN MCKENZIE	M&O/MK	REPOSITORY DESIGN
16	RALPH DRESEL	M&O	Const. Engrg Mgr.
17	ROBERT SAUNDERS	M&O/MK	DESIGN SUPERVISOR-ESF SUBSURFACE
18	W.F. Dalton, Jr	M&O/TRW	ACD PE
19	Mike Lugo	M&O/TRW	Compliance Integration Mgr.
20	Sitakanta Mohanty	CNWRA	Sr. Res. Sci.
21	Amitava Ghosh	CNWRA	Senior Research Engineer
22	Bernard J. Verna	DOE	Design Team Lead
23	Bill Sublette	SAIC	Const. Engr.
24	Steve Dana	BATSS	Lead QAE

NRC/DOE TECHNICAL MEETING
ON EXPLORATORY STUDIES FACILITY
NOVEMBER 7, 1994

	PRINT NAME	COMPANY	TITLE
1	Ken Gilkerson	SAIC	Sr QA Specialist (YMQAD)
2	Brad Bush	M&O	Intergovernmental Activities County Relations
3	Tom Fortner	DOE	DOE CONST MGR
4	CARRY MORRISON	M&O	C.O.E - MECHANICAL ENGR
5	Samantha Richardson	DOE	Public Affairs
6	Joe Willis	M & O	QE manager
7	JERRY HEANEY	M+O	MGDS QA COMPLIANCE
8	Bruce Stanley	PMO	Integrator
9	RICHARD MORISSETTE	PMO	Systems Engineer
10	JIM BLAYLOCK	DOE	YMQAD
11	JACK NESBITT	M+O	ESF PROJ. ENGR. MGR.
12	Jim GRUBB	STATE	ENGINEER
13	APRIL V. GIL	DOE	TEAM LICENSING, YMSCO
14	RANJAN JAGANNATH	NRC	Sr. Electrical Engr. NMSS
15	Mark Delligatti	NRC	Lic Project Manager
16	Joe Holonich	NRC	Chief, HLUR
17	MYSORE NATARAJA	NRC	Acting Section Chief
18	JAKE PHILIP	NRC	PROJECT MANAGER
19	A. G. Douglas	CLV	SR Geologist
20	PHILIP S. JUSTUS	USNRC	SR Geologist
21			
22			
23			
24			

APPENDIX B

List of Participants at the NRC/DOE Technical Exchange on Field Heater Experiments Associated with Coupled TMHC Processes on November 9, 1994

TMHC COUPLED PROCESSES TECHNICAL EXCHANGE 11/9/94

ATTENDEES LIST.

NAMES	ORGANIZATION	TITLE
N.T. SIMMS	M&O	REG/LICENSING
CARL JOHNSON	STATE	TECH. PROGS
Thomas Bierstedt	YMSCO	Licensing/suitability YMSCO
Christian E. Einberg	DOE/HQ	Regulatory Integration
Ardyth M. Simmons	DOE/YMSCO/AMSP	Team Ldr- Geochemistry
MICHAEL BELL	NRC/DWM	CHIEF, ENGR
MYSORE NATARAJA	NRC/DWM	TEAM LEAD, GEOTECH ENGR
NICK STELLAVATO	Nye County	ON Site Rep
E.V. TIESENHAUSEN	CLARK COUNTY	ENG. SPEC.
R. Daniel Dresser	Weston	Sr. Scientist
Bruce Robinson	Los Alamos	PI
BILL GLASSLEY	LAWRENCE LIVERMORE NL	LLNL TASK LEADER - GEOCHEMISTRY
Tom Buscheck	Lawrence Livermore Nat'l Lab	LLNL Task Leader-Hydrology
RON GREEN	CNWRA	SR RES SCI
WILLIS CLARKE	LLNL	TPO
DOC MCNEELY	PMO	ENGINEER
KEITH. J. LOBO	PMO	SENIOR PROJECT ENGINEER
Ram B. MURTHY	DOE/HQ	OQA
Philip R. HAMMOND	M&O	Regulatory
Randall D. Manteufel	CNWRA	Research Engineer
Bob Gamble	M&O	Sr Consultant
Robin N. Datta	M&O	Sr. Proj. Engr.
Duwayne A. Chesnut	LLNL	Sr. Science Advisor

ATTENDEES LIST.

NAMES	ORGANIZATION	TITLE
CADY JOHNSON	M&O/WCFS	SR. PROJ. HYDROGEOLOGIST
VICTOR TALCIAUSKAS	NWTRB	Sr. Tech. Staff
Wunan Lin	LLNL	Task Leader
Bansal Jagannath	NRC	Sr. Content Eng.
Asad Chowdhury	CNWRA/SWRI	Proj. Manager
WILLIAM Boyle	DOE	Physical Scientist
Stephen Blair	LLNL	Task Leader - Geomechanics
Amitava Ghosh	CNWRA/SWRI	Senior Research Engineer
Sitakanta Mohanty	CNWRA/SWRI	Sr. Res. Sci.
Jacob Philip	USNRC	Project Manager
Stephen T Nelson	M&O/USGS	Asst. Proj Geochemist
JAJ Docka	M&O/Enviro	Reg Comp
Don Shettel	GMII/State of NV	Tech. Consultant
Rex Wescott	NRC	Sr. Hydrologist
Dale Wilder	LLNL	Tech Area Coord.
Raymond Mehe	M&O/WCFS	Sr. Proj. Engr

APPENDIX C

Agenda for the NRC/DOE Technical Meeting on ESF Update on November 7, 1994

DOE-NRC TECHNICAL MEETING AGENDA
EXPLORATORY STUDIES FACILITY DESIGN AND CONSTRUCTION UPDATE
Room 450, Bank of America Building

November 7, 1994 Las Vegas, Nevada

1:00pm	Opening Remarks Action Item Status	DOE, NRC, State, Counties, Affected Parties
1:15	ESF Design and Construction Progress	DOE(Replogle)
1:45	NRC's Response to DOE's Presentation on 3/30/94 letter	NRC
2:15	Status of DOE's Response to NRC's 10/13/94 Letter	DOE(Brocoum)
2:30	Management Plan for Resolving QA Issues	DOE(Segrest)
3:00	Break	
3:15	ESF Ground Support Design	DOE(Pye)
3:45	Design Package 2C Basis For Design Documentation	DOE(Morrison)
4:15	Drilling, Testing and Sampling Program Update	DOE(Boyle)
4:45	Open Discussion on the Following Issues: Waste Isolation Impacts MPC / GROA Design	DOE(Voegle-moderator)
	Break	
	NRC Comments	NRC
	Items of Concern to State of Nevada	NV
	Items of Concern to Local Governments	LG
	Closing Remarks	All
	Adjourn	

Note: Time will be allotted for discussion following each agenda topic.

APPENDIX D

Agenda for the NRC/DOE Technical Exchange on Field Heater Experiments Associated with Coupled TMHC Processes on November 9, 1994

DOE-NRC TECHNICAL EXCHANGE DRAFT AGENDA
FIELD HEATER EXPERIMENTS ASSOCIATED WITH COUPLED
THERMAL/HYDROLOGIC/MECHANICAL/CHEMICAL (THMC) PROCESSES

November 9, 1994 Las Vegas, Bank of America Building, Room 450

SCHEDULE	TOPICS	PRESENTER
8:00am	Opening Remarks	DOE/NRC
8:15	Regulatory Bases for Evaluating THMC Processes	NRC
9:00	DOE's Approach to Coupled THMC Processes - THMC Processes Requirements - THMC Study Program	DOE
9:45	BREAK	
10:00	Testing Plans & Goals, and the Intended Use of Testing Results	DOE
11:00	Lessons-Learned from Tests in G-Tunnel and the Climax Facility	DOE
11:45pm	LUNCH	
1:00	Fran Ridge Large Block Experiment and Exploratory Studies Facility Engineered Barrier System Field Test	DOE
2:45	BREAK	
3:00	Status of Coupling Approaches	DOE
5:00	Closing Remarks	DOE/NRC State of NV AUG
5:15	Adjourn	

STATUS OF COUPLING APPROACHES

Analysis and Testing of Heat-Driven Coupled Processes:

Hydrologic Effects - Tom Buscheck, LLNL

Geochemical Effects - Bill Glassley, LLNL

Status of Coupled Thermohydrologic-Geochemical Modeling - Bruce Robinson, LANL

Geomechanical Effects - Steve Blair, LLNL

Field Experiments Associated with Coupled THMC Processes - John Pott, SNL