



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555-0001

February 17, 2004

MEMORANDUM TO: ACNW Members
ACNW Staff

FROM:

Michele S. Kelton
Michele S. Kelton
Technical Secretary, ACNW

SUBJECT: CERTIFIED MINUTES OF THE 147TH MEETING OF THE ADVISORY
COMMITTEE ON NUCLEAR WASTE (ACNW) NOVEMBER 19-20, 2003

The proposed minutes of the subject meeting have been certified as the official record
of the proceedings for that meeting.

Attachment:
Certified Minutes, 147th ACNW
Meeting, November 19-20, 2003

cc: J. Larkins, ACRS/ACNW
H. Larson, ACNW/ACNW
A. Bates, SECY (O-16C1)
P. Justus, NMSS (T-7F3)
I. Schoenfeld, EDO (O-16E15)



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555-0001

MEMORANDUM TO: Michele S. Kelton, Technical Secretary
Advisory Committee on Nuclear Waste

FROM: B. John Garrick, Chairman
Advisory Committee on Nuclear Waste

SUBJECT: CERTIFIED MINUTES OF THE 147TH MEETING OF THE
ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)
NOVEMBER 19-20, 2003

I certify that, based on my review of these minutes¹, and to the best of my knowledge and belief, I have observed no substantive errors or omissions in the record of this proceeding subject to the comments noted below

Comments:

B. John Garrick, Chairman

Date

¹⁾ Minutes of 147th meeting held on November 19-20, 2003, dated February 10, 2004

Dr. B. John Garrick

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FACSIMILE COVER SHEET

Date: 02/17/04

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MESSAGE:

Outstanding set of minutes.



MEMORANDUM TO: Michele S. Kelton, Technical Secretary
Advisory Committee on Nuclear Waste

FROM: B. John Garrick, Chairman
Advisory Committee on Nuclear Waste

SUBJECT: CERTIFIED MINUTES OF THE 147TH MEETING OF THE
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NOVEMBER 19-20, 2003

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Comments:


B. John Garrick, Chairman

Date 02/17/04

⁽¹⁾ Minutes of 147th meeting held on November 19-20, 2003, dated February 10, 2004.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555-0001

February 10, 2004

MEMORANDUM TO: B. John Garrick, Chairman
Advisory Committee on Nuclear Waste

FROM: Michele S. Kelton, Technical Secretary
Advisory Committee on Nuclear Waste

SUBJECT: PROPOSED MINUTES OF THE 147TH MEETING OF THE
ADVISORY COMMITTEE ON NUCLEAR WASTE (ACNW)
NOVEMBER 19-20, 2003

Enclosed are the proposed minutes of the 147th meeting of the ACNW. This draft is being provided to give you an opportunity to review the record of this meeting and provide comments. Your comments will be incorporated into the final certified set of minutes as appropriate. Please provide your corrections and comments to me.

Please note that these minutes are being issued in two parts: (1) main body (working copy form) and (2) appendices. The appendices are being sent only to those members who have requested them.

A copy of the certified minutes with appendices will be forwarded to each member.

Enclosure: As stated

cc w/o Encl. 2: ACNW Members
ACNW Staff
J. Larkins, ACRS/ACNW
S. Bahadur, ACRS/ACNW

CONTENTS

	<u>Page</u>
I. Yucca Mountain Site Visit and Amargosa Valley (Nevada) Bus Tour	1
II. Chairman's Report (Open)	3
III. Department of Energy Opening Remarks (Open)	4
IV. Yucca Mountain Program Status (Open)	5
V. Repository Design Status (Open)	6
VI. Department of Energy Approach to Drift Degradation Analyses (Open)	9
VII. Stakeholder Interactions (Open)	11
VIII. Igneous Activity Status Report (Open)	13
IX. Inyo County Carbonate Drilling Program Status (Open)	16
X. Nye County Early Warning Drilling Program (Open)	17
XI. Electric Power Research Institute Workshop on Natural Analogues (Open)	18
XII. Presentations by Affected Units of Local Government (Open)	19

APPENDICES

- A *Federal Register* Notice
- B Meeting Agenda
- C Meeting Attendees
- D Documents Provided to the Committee

CERTIFIED

2/17/04

BY B. JOHN GARRICK

Issued: 2/10/04

**CERTIFIED MINUTES OF THE 147TH MEETING OF THE
ADVISORY COMMITTEE ON NUCLEAR WASTE
NOVEMBER 19-20, 2003**

The U.S. Nuclear Regulatory Commission (NRC) Advisory Committee on Nuclear Waste (ACNW or the Committee) held its 147th meeting on November 19-20, 2003, in the Dallas Ballroom D at the Texas Station Hotel, 2101 Texas Star Lane, Las Vegas, Nevada. The ACNW published a notice of this meeting in the *Federal Register* on November 10, 2003 (68 FR 63827) (Appendix A). This meeting served as a forum for attendees to discuss and take appropriate action on the items listed in the agenda (Appendix B). The entire meeting was open to public attendance.

A transcript of selected portions of the meeting is available in the NRC's Public Document Room at One White Flint North, Room 1F19, 11555 Rockville Pike, Rockville, Maryland. Copies of the transcript are available for purchase from Neal R. Gross and Co., Inc., 1323 Rhode Island Avenue, NW., Washington, DC 20005. Transcripts may also be downloaded from, or reviewed on, the Internet at <http://www.nrc.gov/reading-rm/doc-collections/acnw/tr/> at no cost.

ACNW Members who attended this meeting were Dr. B. John Garrick, Chairman, Dr. Michael T. Ryan, Vice-Chairman, and Dr. Ruth F. Weiner. Dr. Hornberger did not attend this meeting. Dr. James Clarke, ACNW consultant, was also present. For a list of other attendees, see Appendix C.

I. YUCCA MOUNTAIN SITE VISIT AND AMARGOSA VALLEY (NEVADA) BUS TOUR

[Michael Lee was the Designated Federal Official for this portion of the meeting.]

On the morning of November 18, 2003, the Committee toured the exploratory studies facility (ESF) at Yucca Mountain, Nevada. The focus of the tour was to review the geologic features identified in the ESF that can be used to predict the stability of the rock mass surrounding underground openings (or drifts) that would be part of any future geologic repository at Yucca Mountain. The tour was conducted primarily by Dr. Mark Board, a rock mechanics expert employed by the U.S. Department of Energy's (DOE's) management and operating contractor, Bechtel-SAIC, Company. Previously in October 2003, the ACNW was briefed by the NRC staff suggesting that underground excavations constructed as part of a Yucca Mountain repository could collapse soon after permanent closure of the facility. In large measure, the NRC staff has relied on a rock quality index system used to predict the stability of freshly excavated rock in

underground mining as well as a ground subsidence study for near-surface coal mines in Pennsylvania as the technical bases for their drift degradation model. DOE does not agree with the results of the staff's predictive models nor the technical bases.

In summary, Dr. Board expressed the view that there was no geologic evidence to suggest that the rock mass proposed as the emplacement horizon for the geologic repository (the Topopah Spring welded tuff [TSw]) presented any significant engineering challenges to designers. Although there are some portions of the ESF (in other geologic units), where localized geologic conditions dictated use of elaborate ground support measures (steel sets, lagging, and shotcrete), most of the underground openings excavated to date at the site were in geologically stable rock and required no special ground support measures.¹ Dr. Board observed that in the more than 10 years of underground operations, which included in situ stress measurements, there have been no reported incidents of drift instability, including falling rock. Dr. Board also cited triaxial rock core tests performed in laboratories, numerical modeling exercises conducted on computers, and natural analogue evidence observed at the site (i.e., undeformed bubblelike openings or "lithophysae" within the 12.8 million year-old TSw) as further examples of rock mass stability. For these reasons, Dr. Board said that repository drifts excavated in Yucca Mountain are expected to remain stable through the pre-closure phase of repository operations (100 years) and very likely, for a period of time significantly longer (e.g., an order of magnitude or more). Later, during the Committee's 147th meeting, Dr. Board provided the Committee with a presentation on the technical bases for DOE's alternate position on this matter. Information obtained from the underground site visit and the subsequent DOE briefing on the DOE's rock mechanics programs is expected to help the Committee prepare a letter report on rock mechanics issues at Yucca Mountain.

Following the site visit, in the afternoon, the Committee participated in a bus tour of the nearby community of Amargosa Valley. The local population there numbers about 1500, in about 500 residences, and most individuals obtain their drinking water from a geologic aquifer that is down gradient from the proposed Yucca Mountain repository. The Committee intends to conduct a working group meeting on biosphere dose calculations in February 2004, and the bus tour was intended to contribute to the Members' knowledge base for that meeting. In particular, the Committee hoped to learn more, first hand, from the perspective of a local knowledgeable resident, Mr. Robert Mr. McCracken² about the characteristics and lifestyles of this rural farming area.

As a matter of background, Mr. McCracken noted that most local residents work full time, in occupations outside of the valley, or maintain part-time retirement residences there. Privately-owned land was acquired through Federal homesteading laws, which required would-be homesteaders to develop wells, clear the land, and establish irrigation-based farms before receiving land patents. Most of the land in the valley though is still federally-owned. Local residents benefit from the presence of a community center and library, a primary school,

¹Standard ground support measures in the ESF, the so-called Enhanced Characterization of the Repository Block (ECRB) study, and test alcoves and niches is generally limited to the use of rock bolts and wire mesh in the crown of the drifts.

²The bus tour was conducted by Mr. McCracken, who has operated a private ranch in the Valley since 1992. He raises alfalfa and has a commercial pistachio nut orchard.

volunteer fire department, a police substation, a U.S. Post Office, and several houses of worship. Aside from the Ponderosa Dairy, a specialty clay mine (and associated processing mill), and a few large alfalfa farms, there are few commercial enterprises in the valley. There are a few examples locally of where some commercial operations have ceased. There is a 60-room casino-hotel (the "Longstreet Inn") at the southern end of the valley, on State Highway 373, at the California State line. To the east of State Highway 373, in a relatively undeveloped portion of the Amargosa Valley, there is the Ash Meadows National Wildlife Refuge with its protected desert pupfish.

As part of the tour, Members were briefed on operations at the Ponderosa Dairy and local alfalfa farms. The Ponderosa Dairy is likely the largest single commercial operation in the valley. It is a collection of 3 contiguous dairies that house about 2000 Holsteins. Current operations included about 6000-head at the dairy. It was reported that the dairy owner was attempting to receive financial underwriting for the construction of a fourth facility, increasing the operation's dairy capacity to about 7500 head.

Mr. McCracken noted that the principal agricultural crop in the area was alfalfa, which is well suited to the arid environment. To be of sufficient quality for use, locally grown alfalfa requires the application of significant quantities of irrigation water and fertilizer. Most of the local production was dedicated fodder for the dairy or sold to horse ranchers in neighboring Pahrump Valley. Local agricultural production is insufficient for the dairy, so most cattle feed is imported from sources outside of the valley. It is estimated that about 20 percent of the dairy production is certified "organic" milk. Two of the alfalfa farms also produce certified organic products. The proposed repository is of concern to these local operators, because should it be built, their organic products may be perceived by consumers as being tainted. Other examples of other lesser agricultural activities taking place were highlighted and included a fresh-water lobster hatchery, an ornamental palm tree farm, and two pistachio nut orchards. Many of the "ranches" had small kitchen gardens, and a DOE contractor attending the tour (Kurt Rautenstrauch) commented that the DOE estimates that about 70 percent of the residences maintain such gardens.

Both the underground tour and bus excursion were organized by DOE. Representatives of affected units of government and selected stakeholder organizations (i.e., the State of Nevada, Clark County, and the Nevada Nuclear Waste Task Force) accompanied the Committee.

II. CHAIRMAN'S REPORT (OPEN)

[Dr. Sher Bahadur was the Designated Federal Official for this portion of the meeting.]

Dr. B. John Garrick, ACNW Chairman, convened the meeting at 10:30 a.m. and briefly reviewed the agenda. He also stated that the meeting was being conducted in conformance with the Federal Advisory Committee Act. In addition, Dr. Garrick asked members of the public who were present and had something to contribute to the meeting to inform the ACNW staff so that time could be allocated for them to speak. He concluded his report by noting the following items of interest.

- On January 2, 2004, after 40 plus years of service with the NRC, Ms. Carol Ann Rowe, Administrative Secretary to the ACRS/ACNW Executive Director, will retire.

- Dr. Hossein Nourbakhsh has been selected as an ACRS Senior Staff Engineer. Mr. Nourbakhsh has been serving both Committees as a Senior Fellow, concentrating on the risk assessment area.

III. DEPARTMENT OF ENERGY OPENING REMARKS (OPEN)

[Mr. Howard Larson was the Designated Federal Official for this portion of the meeting.]

Chairman Garrick introduced Russell Dyer, DOE, who welcomed the Committee to Nevada.

The Office of Civilian Radioactive Waste Management (OCRWM) assessment of progress towards the submittal of a license application (LA) for the Yucca Mountain repository was presented by Dr. Dyer. He noted that significant progress has been made during the past 4 months, particularly in the percent completion of effort in the preclosure safety assessment (PCSA) from 14 percent to 51 percent complete and the total system performance assessment-LA (TSPA-LA) (35 percent to 63 percent complete). The total weighted completion of LA activities now stands at 43 percent, and DOE continues its commitment to a December 2004 LA submission date.

Dr. Dyer summarized the status of LA data, codes, and models, by stating that all codes and models will be verified before the LA submittal.

Considerable emphasis was placed on the status of the key technical issue (KTI) agreements. He noted that considerable progress had been made in the past few months insofar in submitting KTIs, and although some submissions are still somewhat behind schedule, all KTIs would be addressed before the LA. Next discussed was the process for the current OCRWM Corrective Action Program. This program, although recently adopted (September 29, 2003), is being used by management at all levels.

Dr. Dyer discussed the OCRWM 2003 Safety Conscious Work Environment study. In response to a question from the Committee, he stated that the results of the study had been benchmarked against the national laboratories but not against the standards of the nuclear industry. The survey was sent to appropriately 2300 people in the program with a 65 percent return — considered to be a significant survey response. In summarizing the results, Dr. Dyer listed six "Strengths to Maintain" findings as well as four "Areas for Improvement."

Committee members asked whether public interactions were included in the survey and were informed that they were not included in this one.

Lastly, based upon September 2003 data, a matrix entitled, "Yucca Mountain Project Performance Indicators" was displayed. Four areas were evaluated as "degraded." These were quality assurance (QA), surface facility development, quality program health, and self-reporting culture. DOE intends to address these four areas and raise the performance indicator evaluation.

IV. YUCCA MOUNTAIN PROGRAM STATUS (OPEN)

[Mr. Howard Larson was the Designated Federal Official for this portion of the meeting.]

Mr. Joseph Zeigler, Director, Office of License Application and Strategy, Office of Repository Development, DOE, discussed the following in his presentation:

- License Application Status
- DOE Feedback on NRC Risk Ranking of KTI Agreements
- KTI Agreement Status
- Design Evolution

He reiterated that DOE plans to submit a complete, high-quality LA and is working towards the Licensing Support Network certification requirement. He proceeded to elaborate on these areas, which Dr. Dyer had discussed in the preceding presentation.

Next Mr. Zeigler discussed the KTI agreement subjects to which NRC gave a "high" risk-ranking and the DOE relative risk ranking of the same agreements. NRC risk-ranked the following KTI agreement subjects as "high":

1. Corrosion of waste package and drip shield
2. Probability of volcanic disruption
3. Aircraft crash
4. Mechanical degradation of waste package and drip shield
5. Effects of in-package chemistry on waste form dissolution
6. Radionuclide transport in saturated zone
7. Radionuclide transport in volcanic ash

Mr. Ziegler noted that DOE's perspective differed, observing that the risk associated with geologic disposal at Yucca Mountain is not "high" in an absolute sense.

He then discussed DOE's plans regarding KTI resolution, noting that DOE plans to address each KTI agreement prior to LA submittal. Although DOE is still behind the agreed-upon schedule, its "bundling" approach has closed the gap. Specifically noted were the Biosphere Transport submission on September 24, 2003, addressing 7 KTI agreements, the Saturated Zone Flow and Transport submission on October 2, 2003, addressing 18 KTI agreements, the Colloid submission on October 3, 2003, addressing 7 KTIs and 4 "additional information needed" agreements and the Water Separation into Drifts submission on October 31, 2003, addressing 4 KTI agreements. He stated that the following integrated KTI packages are in process for a November 2003 submission: Volcanic Events addressing 3 KTI agreements, In-Drift Chemical Environment addressing 16 KTI agreements, and Waste Package and Drip Shield Corrosion addressing 9 KTI agreements.

The current submission schedule for the remaining 14 bundle packages was discussed. It was noted that DOE intends to accelerate, where possible, the submission of the remaining seven packages.

He closed the presentation with a discussion of the evolution of the design for the surface facilities, the subsurface repository, and the waste packages—from the Viability Assessment renditions through the Site Recommendation package through the forthcoming LA.

The design evolution over this time frame has resulted in significant changes in each of the areas discussed. For example, the subsurface repository is now planned as a single-level, four-disposal-panel, phased development with robust forced ventilation. This design necessitates the development of a third portal called the North Construction Portal. The surface facility also reflects a new concept of multiple buildings and fuel handling for commercial spent nuclear fuel, plus a phased construction approach.

In response to several questions from the Committee Mr. Ziegler stated:

1. DOE will submit the LA with a high-temperature repository design.
2. The top issue for DOE is the resolution of QA issues.
3. There is zero float in the current LA submission schedule (i.e., no contingency provided, no effort to quantify uncertainties).

Committee Members thanked Mr. Ziegler for his presentation and the design evolution insights, expressing their intent to closely monitor progress as the LA submission date approaches

V. REPOSITORY DESIGN STATUS (OPEN)

[Mr. Richard Major was the Designated Federal Official for this portion of the meeting.]

Mr. Paul Harrington, DOE, presented an update on the Yucca Mountain repository design and gave preliminary PCSA results. Additional design details will be added for the LA. The PCSA preliminary results are based on the April 2003 repository design. Changes in the design of the surface facilities were made over the past year in part to reflect the experience of Cogema which has recently become a DOE contractor.

The PCSA examines internal and external hazards. Estimates are made of the frequency of event sequences, and consequences of events are given as dose estimates. Dose estimates are calculated for the public and repository workers from each event sequence. DOE will classify structures, systems, and components that are credited with prevention or mitigation of Category 1 or 2 event sequences as Safety Category. (Category 1 events are expected to occur one or more times before permanent closure of the repository. A Category 2 event has one chance in 10,000 of occurring before permanent closure.) Natural or engineered barriers that are important to meeting 10 CFR Part 63 dose objectives are classified as Safety Category. Other structures, systems, and components are classified as being in the nonsafety category.

A preliminary PCSA was completed in the spring of 2003. Results of the preliminary PCSA will influence the LA design. The PCSA will be repeated for the final LA design.

Mr. Harrington described the design of surface facilities for the repository. The design was influenced by Cogema's extensive process experience from the La Hague (France) facility. Among the most recent design changes is a transportation cask receipt facility with a buffer

storage area. A separate building will be used as a canister handling facility. There will be two dry transfer facilities with remediation capability that will be constructed in phases. The dry transfer facilities will process the fuel, placing the spent fuel in the waste packages (WPs), primarily using dry handling techniques. Each of the dry transfer facilities will have a small pool for remediation and handling damaged fuel. DOE has returned to a rail-based transporter to place the waste packages in the emplacement drifts. Surface aging pads for the spent fuel will have a capacity of up to a 20,000 metric tons of heavy metal.

DOE will construct surface facilities at Yucca Mountain in phases. This will allow a small initial disposal capability. The phased approach will also provide maximum flexibility to adjust to future changes in funding, scheduling, and the amount of the incoming waste.

The results of the current PCSA were presented. There were no Category 1 or 2 external event sequences (e.g., earthquake or tornado). There were two Category 1 internal event sequences involving the drop or collision of commercial spent nuclear fuel assemblies in a dry transfer facility. Thirty-one Category 2 internal event sequences were identified for cask, canister, and assembly handling (drops or collisions) in the surface facilities. There were no Category 1 or 2 event sequences identified for the waste aging facility. The offsite doses from normal operations and Category 1 event sequences are predicted to fall below regulatory limits. Worker doses from normal operations and Category 1 events sequences are predicted to fall below regulatory limits. Category 2 offsite doses are also predicted to fall below regulatory limits.

Aircraft hazards were analyzed using methodology similar to that found in the Standard Review Plan for Nuclear Power Plants. The attempt was to screen this hazard out due to low probability. However, planned changes in use of the Nevada Test Site airspace by the U. S. Air Force operating at the Nellis Air Force Base, e.g., an increase in flights, will require reevaluating the aircraft crash hazard.

Surface facilities are designed to meet a radiation goal for workers of 500 mrem/yr. The as-low-as reasonably achievable (ALARA) principle will be applied to further lower doses using remote handling operations for high-radiation activities and shield walls to limit personnel access during operations.

Mr. Harrington discussed the subsurface design of the facility. He explained that thermal design goals would limit cladding temperature to 350° C, limit preclosure drift wall temperature to 96° C, and limit postclosure drift wall temperature to 200° C. Drift pillars will be allowed to drain ground water since a portion of the drift pillar temperature will remain below the boiling point of water. The ventilation system must provide 15 m³/s of air per emplacement drift for a period of 50 years after final emplacement to meet the thermal goals. Waste packages will be emplaced 0.1 meters end to end. There will be 41 miles of emplacement drifts available.

The first emplacement panel was described. Panel 1 will consist of eight emplacement drifts. There will be 13,000 ft of useable emplacement drift. Panel 1 is geologically located approximately half in the lower lithophysal and half in the middle nonlithophysal rock zones. A portion of Panel 1 will be used as a test area for performance confirmation.

The emplacement drifts will use perforated stainless steel sheets and rock bolts for ground support. The emplacement gantry will be electrically powered. The emplacement drift invert

will be made of carbon steel and used to support the emplacement gantry rail system, waste package supports, and drip shields (DSs) during the preclosure period. Ballast material made of crushed tuff will help support waste packages and DSs during the postclosure period.

Ground support for nonemplacement openings will use fully grouted rock bolts and wire mesh fabric from springline to springline. Four inches of shotcrete will be applied to turnouts and intersections in the access and exhaust mains. Four inches of shotcrete will also be applied in the shafts.

The results of the Subsurface Facility Preliminary PCSA were presented. There are no Category 1 or Category 2 event sequences in the subsurface facilities. The waste package, waste package transporter, and emplacement gantry are important to safety. The following features are important to waste isolation (i.e., meeting Part 63 performance objectives): drift invert, DSs, saturated zone, unsaturated zone, WPs, fuel cladding, and waste form.

In the subsurface facilities ALARA considerations include transporting waste packages in a shielded transporter. Drift turnouts will be designed to reduce the dose rates in the access mains. There will be a differential pressure between emplacement and development areas.

The design of the waste package was discussed. The WP is designed such that breach is beyond Category 2 for postulated event sequences to support the PCSA. Among the postulated event sequences to be evaluated for the WP are rock and object falls onto the WP, WP drops, swingdowns and tipovers, vibratory ground motions, and parametric fires. In the post closure analysis, the following events are analyzed (with the DSs installed): rock fall, vibratory ground motion, weld flaw distribution, and WP and weld area stress state.

Prototype testing of the WP will be conducted to ensure packages can be manufactured as designed. The prototypes will also be used to verify the closure processes and systems and to demonstrate WP handling processes. Fifteen WP prototypes have been planned, scheduled, and budgeted. Prototypes will be produced over a 6-year period from calendar year 2003 through 2008.

The DS design process was described. Postulated events are analyzed to provide information to support model abstractions for the TSPA. Postulated events include rock fall and vibratory ground motion. The DS will be made of titanium and is called Ti-8. Potential changes to the DS under consideration include increased distance from DS to waste package to prevent DS contact with the WP in the event of rock fall, increased stiffness for bending loads and stresses along the bulkheads. Added longitudinal stiffener beams will be used between the bulkheads along the axial direction, to provide additional strength for axial bending loads.

Mr. Harrington stated that the preliminary PCSA indicates the April 2003 design would meet regulatory performance objectives. Structures, systems, and components and engineered features which are important to safety have been identified. A complete design is being developed to support the LA. The PCSA will be updated based on the final LA design to meet regulatory performance objectives.

VI. DEPARTMENT OF ENERGY APPROACH TO DRIFT DEGRADATION ANALYSES (OPEN)

[Mr. Richard Major was the Designated Federal Official for this portion of the meeting.]

Dr. Mark Board, representing Bechtel-SAIC Company, summarized the general sources and mechanisms of mechanical degradation for the drifts at Yucca Mountain. He also reviewed the methodology for simulation and prediction of drift degradation. He presented the results of drift degradation to in situ thermal, seismic, and time-dependent loading. He ended by contrasting the results of DOE and NRC drift degradation results and approaches.

Mechanical degradation is damage- or yield-induced in the rock mass surrounding drifts as a result of applied stresses or time-dependent mechanical effects. The three primary sources of stress change in the rock are in situ gravitational stress, thermal loading, and seismic loads. Currently at Yucca Mountain the rock stresses from tunneling are not sufficient to cause rock yield. The rock is in an elastic state. The thermal stresses on the rock will decrease after the first 1000 years following closure as the radioactive decay energy decreases. In general, seismic loading is not an issue for underground structures which are stable. Peak seismic accelerations occur at the ground surface, not 600 meters below the ground surface.

Areas where rock fall will affect the performance assessment were discussed. Mechanical effects from impact forces will affect the waste package in the PCSA and the DS in postclosure performance assessment. Thermal effects on the in-drift environment caused by rocks piled around the waste package can affect performance of the waste package. Increased seepage caused by rock falls opening more flow paths can affect repository performance.

Dr. Board discussed the four distinct stratigraphic units in the Topopah Spring formation of Yucca Mountain where the repository will be located. Each stratigraphic unit has a different porosity. The upper lithophysal unit has relatively uniform 10-cm-sized cavities. The lower lithophysal unit has much larger, more irregularly shaped cavities. The nonlithophysal rocks lack cavities and their behavior is controlled by the fractures they contain. The intact rock between fractures is quite strong and elastic. The rock would fail along fractures in relatively small wedges, less than one-half ton.

The strength of the lithophysal rock is controlled by its porosity. Although not as strong as the nonlithophysal rock, when the lithophysal rock fails, the rock detaches and fails in small particle sizes. These particles would be about the size of a fist.

Eighty percent of the repository will be located in the lower lithophysal unit. Twelve percent will be located in the middle nonlithophysal unit. Five percent will be located in the upper lithophysal unit and 3 percent will be located in the lower nonlithophysal unit.

Dr. Board made some observations about the existing tunnels in Yucca Mountain. These tunnels are 25 and 16 feet in diameter. The excavations are 5-7 years old. Light ground support was used in these tunnels, including friction bolts and wire mesh in the roof. There has been no observed rock fall in tunnels except for some minor spalling in the thermal alcove drift-scale test. Deformation measurements show the excavations are in equilibrium. It appears

deformation equilibrates shortly after mining. The tunnels should remain open without ground support.

How the rock behaves from a basic mechanics level was explained. The analysis began with a detailed field characterization of the rock mass, which controls the rock properties. DOE is seeking to understand rock variabilities within the tunnels to which DOE has access. Testing of both lithophysal and nonlithophysal rock samples has been carried out in the laboratory to determine the effects of porosity and fractures, respectively, on rock strength. These tests were used to calibrate several numerical approaches to modeling rock behavior. The numerical models were used as laboratory tools for predicting long-term rock behavior.

The geotechnical rock mass properties for the nonlithophysal rock (fractures over 1 meter in length) were used as input into a stochastic model of fracturing. The FracMan finite element model was developed by the oil industry to generate fracture geometries in rocks and estimate oil production. The Yucca Mountain model will simulate a rock mass as a cube 100 meters on a side. Tunnels into this cube are simulated and the behavior of the rock mass is determined. Actual shear tests were performed to get rock properties.

Rock mass properties for the lithophysal rock were tested in a large compression testing machine at Sandia National Laboratories. Porosity has the greatest impact on mechanical properties. For design and analysis purposes, the strength categories that cover the range of lithophysal porosities observed are subdivided into ranges. Ninety percent of the rock mass in the lithophysal unit will have a porosity of 15 percent. Tests and model predictions closely resemble one another. Failure occurs through extension fractures between the holes. Loads are dissipated when the rock fails; additional loads would be transferred to where a solid rock bridge exists between holes. This model is capable of reproducing the basic mechanical response stresses and simulating fracture growth and rock fall.

Results of calculations for nonlithophysal rock fall indicated stable conditions under in situ and thermal load. The rock remains elastic, with little or no rock fall. Seismic loading produces rock falls of relatively small blocks with approximately 90 percent of the rocks less than a cubic meter. It was noted that it is extremely conservative to assume ground accelerations large enough to cause rock fall underground.

Dr. Board discussed how quickly the tunnels will fail. He mentioned that time-dependency estimates in hard rock have not been extensively studied. The complete collapse of tunnels is not inevitable. Many tunnels and natural excavations (large lithophysae, caves, and slopes) stand for millions of years without collapse. The use of empirical "stand-up" time by mining engineers to predict degradation is not relevant. Newer research indicates that even without ground support the tunnels will not collapse.

Dr. Mysore Natarja offered several comments on behalf of the NRC staff. He mentioned the difficulty in making predictions of tunnel conditions and rock behavior 10,000 years into the future. In general, the staff has endorsed the approach adopted by DOE. The staff is still waiting for a formal submittal from DOE; after staff review, a formal position on rock fall will be given. At the present time, the staff has no major problems with DOE's approach.

VII. STAKEHOLDER INTERACTIONS (OPEN)

[Mr. Howard Larson was the Designated Federal Official for this portion of the meeting.]

Upon completion of the presentations on each of the meeting days in Las Vegas, attendees were invited to address the Committee. Nine attendees, representing the State of Nevada, Clark County, a representative of the Paiute Tribe, the Nevada Nuclear Waste Task Force, Citizen Alert, and members of the public and interested stakeholders, spoke before the Committee.

Among the topics discussed were emergency planning, inconsistency in thermal loading applications, projected economic and population growth, risks associated with transportation of high-level waste, need for improved communications with stakeholders, U.S. Air Force aircraft crashes, proper role for performance confirmation and the applicability of natural analogues for the Yucca Mountain setting.

Dr. Jacob Paz (of Environmental Services, Inc.) addressed the Committee about his concerns of possible deleterious bystander effects due to the future operation of a geologic repository. In particular, Dr. Paz was referring to some scientific literature that suggested increased human exposure to radiation and certain heavy metals results in cellular damage and greater cancer risk. He provided the Committee with copies of some of this literature, noting the issue had not been adequately addressed in DOE's environmental impact statement and requested that the Committee refer the issue to the NRC staff for evaluation.

Mr. Robert McCracken addressed the Committee on three issues. The first concerned the unresolved issue of the presence of (modern) bomb-pulse chlorine-36 found in the ESF. In summary, he was challenging the notion advanced by some investigators that the repository was dry and free of water. Mr. McCracken expressed the view that the repository was, in fact "porous" and "leaky," and thus not suitable for the long-term storage of [sic] radioactive waste. The second issue concerned the accuracy of information used in the previous day's field trip used to characterize current Amargosa Valley residents. He suggested that more current and accurate information on local biosphere characteristics was available from direct sources (i.e., local or state authorities) than the data found in the published literature. Mr. McCracken's last issue concerned the adjectives used by Dr. Board to describe drift stability during the previous day's underground tour. The Committee understood that Mr. McCracken was asking if it was possible for Dr. Board to quantify "short-term" and "long-term" in terms of years when expressing his views on how long underground excavations at Yucca Mountain might be free from collapsing roofs.

Ms. Sally Devlin (citizen of Pahrump, Nevada) spoke about the poor noticing of transportation and other Yucca Mountain meetings. She expressed the view that something should be done to improve the announcement of public meetings. She stated her concern that the community of Pahrump, which is in the same county as Las Vegas, is never mentioned when referring to Yucca Mountain. In reference to the NRC QA evaluation of DOE, she stated that no "secret" NRC/DOE meetings should be held.

Dr. Atef Elzeftawy (representing the Las Vegas Paiute Tribe) thanked the Committee for holding a meeting in Las Vegas. He expressed concern that there is not enough information

about the hydrogeology of the unsaturated/saturated zone at Yucca Mountain to provide a good understanding of the system and predict what will happen over 10,000 years. He also was concerned about the lack of communication between DOE and the public. Dr. Elzeftawy thanked the NRC Commissioners and the previous Chairman for coming to Las Vegas 2 years ago. Recently, the NRC staff met with several local Native American organizations. He suggested the Committee obtain the transcript of that meeting as well as hold future meetings with the tribes. Most of the tribes are concerned about transportation issues

Ms. Judy Treichel (representing the Nevada Nuclear Waste Task Force) expressed concerns that some site characterization work may inappropriately be done as performance confirmation work. Examples included volcanism and C-22 corrosion studies. Ms. Treichel did not like the use of terms like "frequency or probability-weighted doses to the public." She finds them misleading. If a volcanic event is simulated to hit a repository, then state what the dose would be. Ms. Treichel was also concerned about major new design changes discussed by DOE at this meeting. These included the new proposed stainless steel lining for the emplacement drifts and some continuing talk about backfill. She suggested that a dairy farmer in Amargosa Valley could not get "the same kind of [bank] loan" that he had gotten before as now the loan would have to be completely paid off by 2010. This was "directly tied to Yucca Mountain." Regarding hazardous materials shipments, Ms. Treichel was concerned about nuclear waste becoming involved in accidents with other materials that could further spread and carry contaminants.

Ms. Treichel's biggest concern was over "secret meetings" being held between NRC and DOE. She felt there was no basis for the agencies to be meeting secretly. In response to Member questions, it was apparent that the meetings had been formally noticed but were not open to the public. Later in the meeting Mr. Jack Parrott (the NRC Onsite Representative) described a public notice dated November 4, 2003, and indicated a wide distribution list. He confirmed that the meeting was closed to the public but was not "secret."

Mr. Don Shettel (representing the State of Nevada) had listened to discussions at this meeting concerning natural analogs and pointed out how very different the underground environs at Yucca Mountain will be from typical analog sites such as caves or rock shelters. Yucca Mountain will be hotter and wetter, a fairly aggressive environment above boiling for a long time. Shettel also felt it was amazing that DOE is putting so many resources into repository design before the canister corrosion problem is solved.

Steve Frishman (representing the State of Nevada) commented on repository thermal loads. DOE has indicated a thermal load line of 1.45 kw/m. But based on a DOE presentation this week, the thermal load line will be much larger, more like 2.4 kw/m. He was concerned that something is happening here. The heat loading in the repository will be very heterogeneous and this has not been accounted for in performance. Mr. Frishman referred to operational logistics for the repository and the fact that the DOE will have little control over what types of waste will be arriving and when. He noted that for waste to cool properly before disposal, it will have to be sitting around at the site and age. He noted that a 20,000 ton aging facility is being planned at the surface facility.

Ms. Peggy Maze Johnson (representing Citizen Alert) was concerned that DOE and NRC are not giving notice of their meetings in commonly used printed or electronic media. She noted that the public has been listening to DOE for years. Now it is time for DOE to listen to the

public. She also noted that many scientists disagree with DOE's findings which creates a credibility problem for DOE. Ms. Johnson is troubled that Yucca Mountain is being forced on Nevadans. In reference to Dr. Dyer's earlier presentation, she expressed the view that a higher than 65 percent response rate on a DOE survey would have been expected. The QA questions about Yucca Mountain are troubling in her view.

Mr. Grant Ludlow (CEO of Allied Science, Inc.) stated that ACNW gets results because there are industrial turnaround experts on the Committee. He said that the General Accounting Office (GAO) is starting to notice the negotiations between NRC and DOE, and maybe they'll publish their findings. Mr. Ludlow noted that NRC is driving the DOE LA, and that concerns him very much because typically regulators don't know the details. And DOE has shown that they don't know the details either. This Committee keeps them honest. Mr. Ludlow also mentioned the idea that there is no safe dose of radiation. He also referred to the murder investigation of a Mr. Paul Brown and suggested that organized crime has been draining money out of the Yucca Mountain project. So maybe the 293 KTIs are irrelevant, built on phony tests. He sees the mountain as being too leaky.

Mr. Ludlow would like to see Pahrump follow the Carlsbad, New Mexico, model used for the Waste Isolation Pilot Project, where a higher socio-economic culture and better schools were introduced over time. He felt that America does a lot better when citizens do things instead of having bureaucrats and politicians do things.

The Committee expressed its thanks to the presenters for their thoughtful comments.

VIII. IGNEOUS ACTIVITY STATUS REPORT (OPEN)

[Mr. Michael Lee was the Designated Federal Official for this portion of the meeting.]

DOE elected to sponsor a peer review of its igneous consequence modeling program in 2002 owing to differing professional opinion between its staff and the NRC staff on how to realistically model potential magma-repository interactions in Yucca Mountain performance assessments. Several NRC/DOE KTI agreements were subsequently developed whose respective outcomes are tied to the peer review recommendations and future DOE decisions on followup actions. In February 2003, DOE's Igneous Consequences Peer Review (or ICPR) Panel issued its final recommendations on the adequacy of DOE's performance assessment models of this potential phenomenon.

The ACNW was briefed on the ICPR. There were three presentations. The first was by a DOE representative, Mr. Eric Smistad, who provided an introduction and overview of the ICPR. In describing the peer review, Mr. Smistad highlighted two points: first, the ICPR Panel produced a consensus report, and second, from DOE's perspective, the ICPR Panel did not identify any significant gaps in DOE's igneous consequence modeling programs.

The second presentation was given by a member of the ICPR Panel, Dr. Frank J. Spera,³ University of California at Santa Barbara, who summarized the panel's comments and recommendations. In his opening remarks, Dr. Spera stressed the complexity of the igneous consequence modeling problem and the various physical processes that need to be accounted for in the performance assessment. Dr. Spera described these dynamical processes and explained how the ICPR Panel examined them in the context of the final report.⁴ Having gone through this thought process, it was Dr. Spera's view that the ICPR Panel would be well positioned to comment on the adequacy of DOE's igneous consequence modeling programs and make recommendations, as appropriate. In summary, Dr. Spera noted the following. First, the ICPR Panel generally found that DOE's performance assessment conceptual model of igneous activity at Yucca Mountain was adequate and reasonable. Second, the ICPR Panel expressed the view that major advances in the understanding of localized magma-drift interactions at the site would *not* be available within the next 3 years (the timeframe during which DOE is expected to submit its LA) and therefore the Panel did not recommend alteration of current DOE models and computer codes. However, the ICPR Panel did make 29 specific recommendations, in the form of additional technical analyses, that it thought DOE should conduct in order to reduce uncertainties in those models and codes, as well as Yucca Mountain volcanology in general. In reaching these conclusions, Dr. Spera noted that the ICPR Panel had reviewed and commented on DOE's ongoing programs. Moreover, the ICPR Panel independently conducted its own performance assessment analyses as a way of better understanding some of those uncertainties and how they might be reduced for the purposes of Yucca Mountain performance assessments.

Having reviewed the literature and existing studies and the Panel's independent analyses, Dr. Spera summarized the ICPR Panel's specific recommendations. These recommendations included (1) specific improvements in geologic knowledge that were necessary to achieve a better understanding of volcanology in the Yucca Mountain region; (2) specific improvements in the ability to model and predict magma-repository interactions; and (3) specific design elements in the underground repository design that, if used, could be expected to mitigate the effects of intrusive volcanism on emplaced waste package canisters.

The last presentation was made by Mr. Michael Cline, representing the Bechtel-SAIC Company, DOE's primary technical assistance contractor. Mr. Cline noted that DOE has not issued detailed responses to the ICPR Panel recommendations at this time. Mr. Cline stated that DOE was in the process of preparing written responses to each of the 29 ICPR Panel comments and recommendations. (These responses are now contained in a report prepared by Bechtel-SAIC Company, dated November 2003, and transmitted to the NRC in a letter dated January 23, 2004). Mr. Cline also noted that the main emphasis of its igneous activity modeling programs prior to the submittal of an LA to construct the repository would be to address the information

³The other ICPR Panel Members were R. J. Budnitz (from Engineering Risk Analysis) until September 2002; E. Detournay (University of Minnesota); L.G. Gustin (U.S. Geological Survey); J. R. A. Pearson (Schlumberger Cambridge Research, United Kingdom); and A.M. Rubin (Princeton University).

⁴Detournay, E., and others, "Final Report of the Igneous Consequences Peer Review," Las Vegas, Bechtel-SAIC Company, February 2003.

needs related to the NRC/DOE KTI agreements applicable to igneous activity.⁵ Nevertheless, in rebuttal, the DOE contractor generally noted the following:

- Recent improvements to its igneous activity consequence models and computer codes, available since the completion of the ICPR Panel's work, were considered generally sufficient by DOE to address some of the panel comments and recommendations. Considering the improvements made thus far, and based on DOE's determination of the risk significance of a potential disruptive igneous event at the site, DOE believes that its improved igneous activity consequence module is sufficient for inclusion in a 10 CFR Part 63 LA.
- The need for improvements to igneous activity consequence models and computer codes in some areas can be obviated by using conservative modeling assumptions and/or bounding parameter distributions.
- Ongoing or planned enhancements, as well as focused confirmatory testing, are expected to satisfy any remaining ICPR Panel-recommended improvements to the consequence models and computer codes.
- DOE intends to update the technical bases for the 1996 Probabilistic Volcanic Hazards Analysis (PVHA) used to estimate the probability of a disruptive igneous event at Yucca Mountain. An update to the PVHA would be consistent with the ICPR Panel recommendations and earlier agreements with the NRC staff.

During the course of the three presentations, there were questions and comments from the ACNW members for the presenters. The following responses are noteworthy:

- The NRC proposed dog-leg/shock wave scenario, in which magma erupts at one end of the repository and flows through the entire repository, damaging any contiguous waste packages, is considered intrinsically unlikely by the ICPR Panel (Spera in response to a question from Dr. Garrick).⁶
- Should there be a volcanic event at Yucca Mountain, it would be of no consequence based on the past geologic record (Spera in response to a question from Dr. Weiner).
- None of the ICPR Panel Members were qualified to critically review the DOE dosimetry models used to predict radioactive exposures to receptor groups from potential igneous events (Spera in response to a question from Dr. Ryan).

⁵Although they were not specifically identified during the meeting, the agreements in question are 2.18 (magma-repository interaction), 2.19 (magma-waste package interactions), and 2.20 (magma-waste form interactions). Also of concern are KTIs 2.17 (volcanic ash redistribution) and 1.02 (igneous event probability).

⁶Mr. Smistad noted that DOE has decided to retain this scenario as part of its performance assessment Monte Carlo realizations.

- DOE is examining different types of design elements (backfilled drifts, concrete plugs, notches in the crowns of emplacement drifts) as ways mitigate the effects of intrusive volcanism (Spera in response to a question from ACNW consultant, Dr. Clark).

IX. INYO COUNTY CARBONATE DRILLING PROGRAM STATUS (OPEN)

[Mr. Neil Coleman was the Designated Federal Official for this portion of the meeting.]

Mr. Andrew Remus (staff to the Inyo County Yucca Mountain Repository Assessment Office in Independence, California) noted that Inyo County is recognized as an Affected Unit of Local Government. Mr. Remus's organization conducts regional studies of hydrology to determine the potential for radionuclides escaping from the proposed Yucca Mountain repository to impact water supplies critical to Inyo County communities, Death Valley National Park, and territories recently conveyed to the Timbisha-Shoshone Tribe at Furnace Creek and Death Valley Junction in Amargosa Valley.

The county's science program began in 1996 with a study of spring discharge in Death Valley. This study pointed to the possibility that the regional lower carbonate aquifer contributed to potable water supplies in the Park and by extension to the possibility that contamination of the regional aquifer below Yucca Mountain could endanger the Park's water supply. To date, Inyo County has completed one of five wells planned to investigate the ground water system. DOE's Yucca Mountain programs suffered significant budget shortfalls in 2003 with respect to available research monies, the result of which was that DOE was not able to completely fund Inyo County's grant. Inyo County hopes to complete a second well this winter. Inyo County's program is designed to meet Yucca Mountain QA and quality control standards, to ensure that the data generated by the county can be incorporated into the USGS regional ground water model, upon which DOE's TSPA relies.

Mike King (also representing Inyo County) discussed an evaluation of the geological framework model of the Southern Funeral Mountain Range, and Inyo County's revised ground water flow model through the Southern Funeral Mountain Range. Key concerns of Inyo County relate to the future possibility that radionuclides will migrate through the lower carbonate aquifer into the Death Valley spring system. There is also the possibility of future degradation of the upward hydraulic gradient in the lower carbonate aquifer in the Southern Funeral Mountains. This could impact springs in Furnace Creek and could potentially induce radionuclide transport from Yucca Mountain.

Mr. King presented extensive hydrogeologic and geophysical data to the Committee. This included a view of potential flow paths from the Nevada Test Site, the geological framework model for the southern Funeral Mountain range, and the elevation of the top of the carbonate aquifer system based on gravity data. Mr. King then depicted the geology of the Furnace Creek area and showed the locations of Texas Springs and several wells in Death Valley. Mr. King presented two hydrologic models for ground water flow beneath the Funeral Mountains: one based on shallow faults and the other based on deep fault planes. Modeling results suggest that the shallow fault system is unrealistic. The other model reproduced spring flows well, using a transmissivity of 0.2 ft²/sec and a permeability of 0.0001 ft/sec. The model is relatively insensitive to the presence of the Furnace Creek fault. Inyo County concludes that a lower carbonate aquifer flow path most likely exists through the southern Funeral Mountain range.

Secondly, the maintenance of upward gradients in the lower carbonate aquifer is "critical" to support spring flows and prevent radionuclide transport from Yucca Mountain. A 50-foot change in hydraulic head would significantly impact Furnace Creek Springs. Inyo County plans to construct three monitoring wells in the lower carbonate aquifer on the east side of the southern Funeral Mountain range. Monitoring wells will also be drilled in Death Valley within Echo Canyon and near Travertine Spring. Inyo will conduct a water balance analysis of the Furnace Creek alluvial fan area to determine the total discharge from all major springs in this area.

X. NYE COUNTY EARLY WARNING DRILLING PROGRAM (OPEN)

[Mr. Neil Coleman was the Designated Federal Official for this portion of the meeting.]

Mr. Dale Hammermeister (Nye County, Department of Natural Resources and Federal Facilities) gave an overview of the Nye County Early Warning Drilling Program (EWDP). This overview discussed funding and goals, program justification, wells drilled to date, significant findings, and future plans. He described the various cooperative agreements that Nye County has had with DOE since 1998. The primary goals of the EWDP are to characterize potential flow paths between Yucca Mountain and Amargosa Valley, to reduce uncertainty in DOE's performance assessment models, and to support the design of a ground water monitoring network.

The EWDP has greatly expanded the database of hydrogeologic data for the area south of Yucca Mountain within and outside of the Nevada Test Site. A series of new wells have been drilled under the EWDP Phase IV. These include wells 16P, 24P, 27P, 28P, and 29P, all of which have been drilled in the area west of Fortymile Wash and north of Highway 95 and well Nye 2D. Other major activities under EWDP include geophysical logging, lab testing of geologic samples, aquifer testing, ground water level monitoring, and sampling and analysis of ground water chemistry. Samples are shared with DOE and data are available to the public via the Nye County Web site and technical reports.

Mr. Hammermeister described differences between the current EWDP Phase IV and the earlier program phases. Phase IV wells are being drilled exclusively with dual-wall reverse circulation methods. The new holes are being drilled significantly deeper than most of the previous wells. Drive-core samples are being collected from selected depth intervals.

Mr. Hammermeister displayed two geologic cross sections derived from Nye County wells. One parallels Fortymile Wash and the other is perpendicular to it. These cross sections show the distributions of sand and gravel aquifers versus clay rich units that are less permeable. Nye County has found that the alluvium is finer textured with depth and toward the eastern side of Fortymile Wash. Nye County also found that volcanic aquifers change from welded tuffs to volcanoclastic sediments near the so-called Highway 95 fault. They believe this transition has little impact on flow paths in the upper aquifer. Recent drilling of wells 24P and 29P found that it was difficult to correlate tuff units in the area and that buried faulting may be more complex than expected.

Mr. Hammermeister reported several major EWDP findings. The permeability of alluvium and underlying volcanic aquifers can be very high, and upward hydraulic gradients were generally

observed from deeper to shallower aquifers. Flow tends to focus in Fortymile Wash alluvium due to contrasts in permeability. Future work will include tracer tests in alluvium at well site 22, expected to begin in February 2004. Nye County would like to conduct large-scale aquifer tests in wells that span fault systems.

XI. ELECTRIC POWER RESEARCH INSTITUTE (EPRI) WORKSHOP ON NATURAL ANALOGUES (OPEN)

[Mr. Michael Lee was the Designated Federal Official for this portion of the meeting.]

In October 2003, the Electric Power Research Institute (EPRI) organized a panel of experts to examine the use of natural analogs in Yucca Mountain programs. The goal of the workshop was to make specific recommendations to EPRI on where and how such information could potentially be used. In the context of NRC's Yucca Mountain site-specific disposal regulations, it should be noted that the Commission recognizes that natural analog information can be used by DOE to develop the technical basis for portions of its LA. Consistent with those regulations, NRC's Yucca Mountain Review Plan (NUREG-1804) also describes how natural analog information can be used as "acceptance criteria" and "review methods" to review information in any such LA.

The presentation to the ACNW was conducted by Dr. John Kessler, EPRI Project Manager and moderator for the natural analogs workshop. As background, Dr. Kessler defined what was meant by the use of natural analogs, earlier international experience in the use of natural analog information, and how natural analogs could be applied to Yucca Mountain performance assessments. Dr. Kessler also summarized the basis for EPRI's interest in the use of natural analogs as well as the organization's expectations for workshop outcomes.

To provide the depth of experience needed to support the discussions and encourage development of the needed recommendations, Dr. Kessler organized an expert panel that included the following individuals:

	<i>Affiliation</i>
Bill Miller	Enviros (United Kingdom)
Mick Apted	Monitor Scientific
Robert Bernero	independent consultant ⁷
Matt Eyre	Exelon Nuclear Corporation
Maria Gimeno	CIEMAT ⁸ (Spain)
Paul Hooker	Enviros (United Kingdom)
Rod McCullum	Nuclear Energy Institute
Alan Ross	independent consultant
Patrik Sellin	Swedish Nuclear Fuel and Waste Management Co (SKB)

⁷ NRC retired

⁸Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (Research Center for Energy, Environment, and Technology).

Many of the panelists had direct experience in the use of natural analog information in repository programs (both domestically and internationally) and thus could provide recommendations on how such information could potentially be used at Yucca Mountain. Approximately 30 participants, representing NRC, DOE, and their respective contractors, the U.S. Geological Survey, the Nuclear Waste Technical Review Board, and Clark and Nye Counties, Nevada, attended the workshop and contributed to the panel discussions.

In summary, Dr. Kessler highlighted the panel's recommendations:

- Natural analog information can be of value to the repository programs at Yucca Mountain, including but not limited to laboratory studies, field investigations, and performance assessment analyses.
- Intended users of natural analog information need to "buy into" to analog programs before such programs begin.
- Natural analog information can be used to engender public confidence in repository programs.

Dr. Kessler noted that EPRI expects to use the discussions and expert panel deliberations from the workshop to serve as input to a January 2004 report on the possible use of natural analog information in Yucca Mountain programs. During the question and comment period that followed with the ACNW members, questions were raised specifically about the Peña Blanca (Mexico) natural analog studies being conducted by DOE. In response, a DOE representative (Dr. Abe Van Luik) noted that the Department intends to integrate the geologic studies of the uranium oxide deposits at Peña Blanca into its forthcoming license application.

XII. PRESENTATIONS BY AFFECTED UNITS OF LOCAL GOVERNMENT (OPEN)

[Mr. Neil Coleman was the Designated Federal Official for this portion of the meeting.]

Ms. Irene Navis (representing Clark County, Nevada) spoke and noted that this was the third occasion this year on which the county has addressed the Committee on various topics, including performance confirmation, QA, and other technical matters.

Navis discussed other areas of concern for Clark County, focusing on socioeconomic issues. She noted that Clark County is in the fastest growing region of the United States. In 1963 the population was 50,000. The 2000 census shows over a million-and-a-half people. In 2003 the population is 1.6 million. Clark County helps drive the economy of the entire State of Nevada. Clark County is concerned about the effects on the local economy of potential accidents at Yucca Mountain or along transportation routes. Since cities are not designated as Affected Units of Local Government, Clark County has taken a leadership role and partnered with those entities to help address their needs regarding public safety preparedness, emergency management capability, and other government service needs. Ms. Navis stated that transportation of high-level nuclear waste through the Las Vegas Valley would be a bad idea.

Ms. Navis noted that Clark County is not just the Las Vegas strip - it is a unique mix of urban service-provided areas and governance, and the county has first responder status for the entire

region. There are also mutual aid agreements with California, Utah, and Arizona. Regardless of what routes are chosen for waste to Yucca Mountain, Clark County is involved in a significant way.

Ms. Navis observed that the recent plane crash at Nellis Air Force Training Range does impact Clark County. The crash occurred less than 20 miles from Indian Springs. She indicated the county has a vested interest in monitoring the decisions of Nellis Air Force Base as the Yucca Mountain project moves forward. In response to questions from Member Weiner, Ms. Navis offered to provide information about the numbers of shipments of hazardous materials that go through Clark County every year. Ms. Navis also offered to make Clark County's meeting facility available to the ACNW for future meetings as a way of encouraging greater public participation in Committee meetings in Las Vegas.

Conservation concurred with the draft EA.

The NRC staff has determined that consultation under Section 7 of the Endangered Species Act is not required because the proposed action is administrative in nature and will not affect listed species or critical habitat.

The NRC staff has determined that the proposed action is not a type of activity that has potential to cause effect on historic properties because it is administrative in nature. Therefore, consultation under Section 106 of the National Historic Preservation Act is not required.

References

Unless otherwise noted, a copy of this document and the references listed below will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

1. Nuclear Fuel Services, Inc., Letter to U.S. Nuclear Regulatory Commission, "Request for Exemption from 10 CFR 70.25(f) Requirements for Portions of the BLEU Preparation Facility at Building 333," October 27, 2003, ADAMS No. ML033030311.

2. U.S. Department of Energy, Letter to U.S. Nuclear Regulatory Commission, "Assurance of Funding for Decommissioning the Equipment and Facilities Associated with the BLEU Project at Nuclear Fuel Services, Inc. Erwin Site," October 20, 2003, ADAMS No. ML033010362.

3. Nuclear Fuel Services, Inc., Letter to U.S. Nuclear Regulatory Commission, "License Amendment Request for BLEU Preparation Facility," October 11, 2002, ADAMS No. ML023380210.

4. U.S. Nuclear Regulatory Commission, "Environmental Assessment for Renewal of Special Nuclear Material License No. SNM-124," January 1999, ADAMS No. ML031150418.

5. U.S. Nuclear Regulatory Commission, "Environmental Assessment for Proposed License Amendments to Special Nuclear Material License No. SNM-124 Regarding Downblending and Oxide Conversion of Surplus High-Enriched Uranium," June 2002, ADAMS No. ML021790068.

6. U.S. Nuclear Regulatory Commission, "Environmental Assessment and Finding of No Significant Impact for the BLEU Preparation Facility," September 17, 2003, ADAMS No. ML032390428.

III. Finding of No Significant Impact

Pursuant to 10 CFR part 51, the NRC staff has considered the environmental consequences of amending NRC Materials License SNM-124 to exempt NFS from the financial assurance

requirements in 10 CFR 70.25(f) for the BPF. On the basis of this assessment, the Commission has concluded that environmental impacts associated with the proposed action would not be significant and the Commission is making a finding of no significant impact. Accordingly, preparation of an environmental impact statement is not warranted.

IV. Further Information

For further details, see the references listed above. Documents may be examined, and/or copied for a fee, at the NRC's Public Document Room (PDR), located at One White Flint North, Room O-1F21, 11555 Rockville Pike, Rockville, Maryland. Publicly available records will be accessible electronically from the Agencywide Document Access and Management System (ADAMS) Public Electronic Reading Room on the Internet at the NRC Web site, <http://www.nrc.gov/reading-rm/adams.html>. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS, should contact the NRC PDR Reference staff by telephone at 1-800-397-4209 or [301] 415-4737, or by e-mail to pdr@nrc.gov.

Dated at Rockville, Maryland, the 3rd day of November 2003.

For the Nuclear Regulatory Commission,
Kevin M. Ramsey,
Project Manager, Fuel Cycle Facilities Branch,
Division of Fuel Cycle Safety and Safeguards,
Office of Nuclear Material Safety and Safeguards.

[FR Doc. 03-28182 Filed 11-7-03; 8:45 am]

BILLING CODE 7590-01-P

NUCLEAR REGULATORY COMMISSION

* Advisory Committee on Nuclear Waste; Notice of Meeting

The Advisory Committee on Nuclear Waste (ACNW) will hold its 147th meeting on November 19-20, 2003, Dallas Ballroom D, Texas Station Hotel, 2101 Texas Star Lane, Las Vegas, Nevada.

The entire meeting will be open to public attendance.

The schedule for this meeting is as follows:

Wednesday, November 19, 2003

10:30 a.m.-10:40 a.m.: *Opening Statement (Open)*—The Chairman will open the meeting with brief opening remarks, outline the topics to be discussed, and indicate items of interest.

10:40 a.m.-11:10 a.m.: *DOE Opening Remarks (Open)*—The Committee will be welcomed and receive introductory comments from John Arthur, Deputy Director, Office of Repository Development, Department of Energy.

11:10 a.m.-12:15 p.m.: *Yucca Mountain Program Status (Open)*—The Committee will hear presentations by and hold discussions with representatives of DOE regarding the status of the development of the License Application, the Licensing Support Network, and the resolution of Key Technical Issues (KTI) including the DOE "bundling" process. In addition there will be an update on several items discussed during the Committee's 2002 visit to Nevada.

1:30 p.m.-4:30 p.m.: *Repository Design Status (Open)*—The Committee will hear presentations by and hold discussions with representatives of DOE regarding the surface facility design, pre-closure safety assessment, and other Yucca Mountain Repository design issues.

4:45 p.m.-5:30 p.m.: *DOE Approach to Drift Degradation Analyses (Open)*—The Committee will hear presentations by and hold discussions with representatives of DOE on the Department's approach to evaluating drift degradation within the Yucca Mountain geologic environment.

5:30 p.m.-6 p.m.: *Stakeholder Interactions (Open)*—The Committee will reserve this time for interactions with stakeholders and meeting participants.

Thursday, November 20, 2003

8:30 a.m.-8:35 a.m.: *Opening Statement (Open)*—The Chairman will make opening remarks regarding the conduct of today's sessions.

8:35 a.m.-9:30 a.m.: *Igneous Activity Status Report (Open)*—The Committee will hear presentations by and hold discussions with representatives of DOE regarding the Igneous Activity Consequence Modeling Peer Review Recommendations and the DOE path forward.

9:30 a.m.-10 a.m.: *Inyo County Carbonate Drilling Program Status (Open)*—The Committee will hear presentations by and hold discussions with representatives of Inyo County (California) regarding its deep carbonate aquifer drilling program.

10:15 a.m.-10:45 a.m.: *Nye County Early Warning Drilling Program Status (Open)*—The Committee will hear presentations by and hold discussions with representatives of Nye County regarding the status of its early warning drilling program.



APPENDIX II
UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, D.C. 20555-0001

October 31, 2003

AGENDA
147th ACNW MEETING
NOVEMBER 19-20, 2003

WEDNESDAY, NOVEMBER 19, 2003, DALLAS BALLROOM D, TEXAS STATION HOTEL, 2101
TEXAS STAR LANE, LAS VEGAS, NEVADA

- 1) 10:30 - 10:40 A.M. Opening Statement (Open) (BJG/JTL)
The Chairman will open the meeting with brief opening remarks, outline the topics to be discussed, and indicate items of interest
- 2) 10:40 - 11:10 A.M. DOE Opening Remarks (Open) (BJG/HJL)
The Committee will be welcomed and receive introductory comments from John Arthur, Deputy Director, Office of Repository Development. **L Russ Dyer for**
- 3) 11:10 - 12:15 P.M. Yucca Mountain Program Status (Open) (BJG/HJL) **Ziegler**
The Committee will be briefed by and hold discussions with representatives of DOE regarding the status of the development of the License Application, the Licensing Support Network, and the resolution of Key Technical Issues (KTI) including the DOE "bundling" process. In addition there will be an update on several items discussed during the Committee's 2002 visit to Nevada.
- 12:15 - 1:30 P.M. *****LUNCH*****
- 4) 1:30 - 4:30 P.M. Repository Design Status (Open) (MTR/RKM) **Harrington**
The Committee will be briefed by and hold discussions with representatives of DOE regarding the surface facility design, pre-closure safety assessment, and other Yucca Mountain design issues.
- 4:30 - 4:45 P.M. *****BREAK*****
- 5) 4:45 - 5:30 P.M. DOE Approach to Drift Degradation Analyses (Open) (BJG/RKM) **Board**
The Committee will be briefed by and hold discussions with representatives of DOE on the Department's approach to evaluating drift degradation within the Yucca Mountain geologic environment.
- 6) 5:30 - 6:00 P.M. Stakeholder Interactions (Open) (BJG/HJL)
The Committee will reserve this time for interactions with stakeholders and meeting participants.

David B. Paz
Prop. M. G. V. K.
T. G. F. A. S. J.

THURSDAY, NOVEMBER 20, 2003, DALLAS BALLROOM D, TEXAS STATION HOTEL, 2101 TEXAS STAR LANE, LAS VEGAS, NEVADA

- 7) 8:30 - 8:35 A.M. Opening Statement (Open) (BJG/HJL)
The Chairman will make opening remarks regarding the conduct of today's sessions.
- 8) 8:35 - 9:30 A.M. Igneous Activity Status Report (Open) (MTR/MPL)
The Committee will be briefed by and hold discussions with representatives of DOE regarding the Igneous Activity Consequence Modeling Peer Review Recommendations and the DOE path forward.
- 9) 9:30 - 10:00 A.M. Inyo County Carbonate Drilling Program Status (Open) (RFW/NMC)
The Committee will be briefed by and hold discussions with representatives of Inyo County (California) regarding its deep carbonate aquifer drilling program.
- 10:00 - 10:15 A.M. ***BREAK*****
- 10) 10:15 - 10:45 A.M. Nye County Early Warning Drilling Program Status (Open) (RFW/NMC)
The Committee will be briefed by and hold discussions with representatives of Nye County regarding the status of its early warning drilling program.
- 11) 10:45 - 11:30 A.M. EPRI Workshop on Natural Analogues (Open) (BJG/MPL)
The Committee will hear an information briefing by a representative of the Electric Power Research Institute (EPRI) regarding its recent workshop on natural analogues and their potential applicability to Yucca Mountain repository programs.
- 11:30 - 12:45 P.M. ***LUNCH*****
- 12) 12:45 - 2:00 P.M. Presentation by Affected Units of Local Government (Open) (BJG/NMC)
The Committee will hear presentations by affected units of local government and Native American Organizations regarding their views on the proposed high-level waste repository at Yucca Mountain.
- 2:00 - 2:15 P.M. ***BREAK*****
- 13) 2:15 - 3:00 P.M. Stakeholder Interactions (Open) (BJG/HJL)
The Committee will reserve this time for interaction with stakeholders and meeting participants.
- 14) 3:00 - 5:45 P.M. Preparation of ACNW Reports (Open)
The Committee will discuss possible reports on:
14.1) Pre-Closure Safety Assessment Tool (RFW/RKM)
14.2) Drift Degradation at Yucca Mountain (BJG/RKM)
14.3) Public Interactions (BJG/MPL)

- 15) 5:45 - 6:00 P.M. Miscellaneous (Open)
The Committee will discuss matters related to the conduct of Committee activities and matters and specific issues that were not completed during previous meetings, as time and availability of information permit.

6:00 P.M. Adjourn 147th Meeting

NOTE:

- Presentation time should not exceed 50 percent of the total time allocated for a specific item. The remaining 50 percent of the time is reserved for discussion.
- Thirty-Five (35) copies of the presentation materials should be provided to the ACNW.
- ACNW meeting schedules are subject to change. Presentations may be canceled or rescheduled to another day. If such a change would result in significant inconvenience or hardship, be sure to verify the schedule with Mr. Howard Larson at 301-415-6805 between 8:00 a.m. and 4:00 p.m. prior to the meeting.

APPENDIX C: MEETING ATTENDEES

147TH ACNW MEETING
NOVEMBER 19-20, 2003

ACNW STAFF

John Larkins
Sher Bahadur
Neil Coleman
Michele Kelton
Howard Larson
Michael Lee
Richard Major
Barbara Jo White

ATTENDEES FROM THE NUCLEAR REGULATORY COMMISSION

NOVEMBER 19, 2003

J. Trapp	NMSS
M. Nataraja	NMSS
J. Parrott	NMSS
T. Kobetz	NMSS
B. Jagannath	NMSS

NOVEMBER 20, 2003

J. Parrott	NMSS
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ATTENDEES FROM OTHER AGENCIES AND GENERAL PUBLIC

NOVEMBER 19, 2003

J. Treichel	Nevada Nuclear Waste Task Force (NNWTF)
M. Apted	Monitor Scientific
S. Hunsicker	Baker Botts
J. Linhart	NSNFP
C. Settles	Ill. Emer. Management Agency
P. Davis	PRD Consulting
R. McCullum	Nuclear Energy Institute (NEI)
J. Shaffner	MTS-E
M. Manning	Las Vegas Sun Newspaper
P. Johnson	Citizen Alert

ATTENDEES FROM OTHER AGENCIES AND GENERAL PUBLIC (CONT'D)

NOVEMBER 19, 2003 (Cont'd)

J. Ziegler	DOE
J. Rivers	Jason Associates
B. Bradbury	Shaw
K. Rogers	Las Vegas Review-Journal
T. Gunter	DOE
M. Rice	Intertech/Lincoln County
C. Hanlon	DOE
A. Gil	DOE
A. Elzeftawy	Las Vegas Paiute Tribe
J. Pegues	City of Las Vegas
M. King	Hydrodynamics
E. v. Tiesenhausen	Clark County CP
A. van Luik	DOE
J. Prince	Bechtel SAIC Co. (BSC)
D. Shettel	GMII/State
B. Gamble	MTS
N. Henderson	BSC
D. Oakley	Florida State Univ.
S. Hanauer	DOE
D. Franklin	NNPP
S. Frishman	State of Nevada
A. Remus	Inyo County Yucca Mtn. Assessment Office
D. Bullen	Nuclear Waste Technical Review Board (NWTRB)
.	NWTRB
C. Bella	DOE
P. Harrington	DOE
D. Coleman	DOE
C. Binzer	Robison/Seidler
Y. Williams	BSC
D. Richardson	BSC
M. Anderson	BSC
K. Lachman	DOE
P. McDaniel	BSC
G. Martin, Jr.	BSC
R. Saunders	BSC
J. Price	DOE
B. Boutin	BSC
A. Kolaeffkowski	SAIC
D. Oserhut	BSC
J. Johnson	BAA
B. Beach	BSC
B. Verne	Self
M. Urie	DOE

ATTENDEES FROM OTHER AGENCIES AND GENERAL PUBLIC (CONT'D)

NOVEMBER 19, 2003 (Cont'd)

D. Barr	DOE
D. Buesch	U. S. Geological Survey
D. Baldman	BSC
D. McCracken	Amargosa, NV
R. McCracken	Amargosa, NV

NOVEMBER 20, 2003

M. Manning	Las Vegas Sun Newspaper
C. Fairhurst	DOE
N. Henderson	DOE
D. Oakley	Florida State Univ.
E. v. Tiesenhausen	Clark County CP
S. Hanauer	DOE
L. Reid	NWTRB
A. Remus	Inyo County Yucca Mtn. Assessment Office
M. King	Hydrodynamics
M. Cline	BSC
F. Perry	Los Alamos National Lab.
D. Hammermeister	Nye County
B. Gamble	MTS
R. Parizek	NWTRB
J. Kessler	Electric Power Research Institute
D. Franklin	NNPP
F. Spera	University of California (Santa Barbara)
E. Smistad	DOE
S. Frishman	State of Nevada
J. Treichel	NNWTF
J. Walker	Nye County
S. Hunsicker	Baker Botts
B. Bradbury	Shaw
R. McCullum	NEI
C. Hanlon	DOE
J. Prince	BSC
J. Savin	Golden ??
D. Shettell	GMII/State of Nevada
A. van Luik	DOE
T. Crump	BSC
G. Appel	BSC
J. Shaffner	NTS-E
J. Paz	Self
J. Rivers	Jason Associates
S. Devlin	Public

ATTENDEES FROM OTHER AGENCIES AND GENERAL PUBLIC (CONT'D)

NOVEMBER 20, 2003 (Cont'd)

G. Hudlow
J. King
M. Rice
J. Schoch
T. Morgan
R. Threlkeld
I. Navis
J. Pegues
A. Elzeftawy

Allied Science Inc.
BSC
Intertech/Lincoln County
U.S. Congressman Jon Porter - Dist. Office
MTS
BSC
Clark County
City of Las Vegas
Las Vegas Paiute Tribe

APPENDIX D: FUTURE AGENDA

The Committee approved the following topics for discussion during its 148th meeting, scheduled for February 24–27, 2004:

- Working Group on Biosphere Dose Assessments for the Proposed Yucca Mountain High-level Waste Repository (February 24–25, 2004)
- Waste Management-Related Safety Research Report
- Radiological Dispersal Devices (Closed)
- Risk Insights Report
- Report on KTI Status and DWM Evaluation of DOE Bundling Approach
- Preparation of ACNW Reports on:
 - Pre-Closure Safety Assessment Tool
 - Drift Degradation at Yucca Mountain
 - Public Interactions during November 2003 Nevada Field Trip
 - Risk Insights Report
 - Report on DWM Evaluation of DOE Bundling Approach
 - Radiological Dispersal Devices (Closed)
 - Biosphere Working Group

**APPENDIX E
LIST OF DOCUMENTS PROVIDED TO THE COMMITTEE**

[Note: Some documents listed below may have been provided or prepared for Committee use only. These documents must be reviewed prior to release to the public.]

MEETING HANDOUTS

<u>AGENDA ITEM NO.</u>	<u>DOCUMENTS</u>
2	<u>DOE Opening Remarks</u> 1. Exhibits, by W. John Arthur, III, DOE [Viewgraphs]
3	<u>Yucca Mountain Program Status</u> 2. Yucca Mountain Program Status, presented by Joseph Ziegler, DOE [Viewgraphs]
4	<u>Repository Design Status</u> 3. Repository Design Status, presented by Paul Harrington, DOE [Viewgraphs]
5	<u>DOE Approach to Drift Degradation Analyses</u> 4. Mechanical Drift Degradation Analysis, presented by Mark Board, DOE [Viewgraphs]
6 & 13	<u>Stakeholder Interactions</u> 5. Risk Assessment of Complex Mixtures and Bystander Effects, presented by Dr. Jacob Paz, J&L Environ. Ser. Inc. [Viewgraphs] 6. Radiation-induced genomic instability and bystander effects: related inflammatory-type responses to radiation-induced stress and injury? A review, by S.A. Lorimore and E. G. Wright, International Journal of Radiation Biology , 2003, Vol. 79, No. 1, 15-25 [Handout] 7. Relevance of Radiation-Induced Bystander Effects for Environmental Risk Assessment, by C. Mothersill, C. Seymour [Handout] 8. Potential Health Impact of Complex Chemical and Radionuclide Mixtures Due to Proposed Nuclear Waste Repositories, by Jacob D. Paz, William G Culbreth, and Delbert Barth, J&L Environmental Services Inc.. Draft [Handout]

MEETING HANDOUTS (CONT'D)

**AGENDA
ITEM NO.**

DOCUMENTS

**6 & 13
(cont'd)**

Stakeholder Interactions (Cont'd)

9. Risk Assessment, Bystander Cells May Play Important Role In Determining Carcinogenicity, Official Says, **Chemical Regulation**, Vol. 27, No. 11, March 17, 2003, Conference Report, Society of Toxicology [**Handout**]
10. PNNL. Low Dose Project: Kinetic Modeling of Damage..., Modeling Bystander Effects Using A Microdosimetric Approach, by R. D. Stewart, E. J. Ackerman, J. K. Shultis, and X. C. Lei, DOE Low Dose Program Workshop III, March 24-27, 2002

8

Igneous Activity Status Report

11. Igneous Consequences Peer Review Introduction, presented by Eric Smistad, DOE [**Viewgraphs**]
12. Igneous Consequences Peer Review Panel Report: Proceedings and Salient Recommendations, presented by Frank Spera, University of California at Santa Barbara [**Viewgraphs**]
13. Responses to Igneous Consequences Peer Review Recommendations presented by Michael Cline, BSC [**Viewgraphs**]

9

Inyo County Carbonate Drilling Program Status

14. Presentation to the NRC Advisory Committee on Nuclear Waste, November 20, 2003, Inyo County, CA, presented by Andrew Remus and Mike King [**Handout**]

10

Nye County Early Warning Drilling Program Status

15. Nye County Early Warning Drilling Program Overview and Findings [**Viewgraphs**]

11

EPRI Workshop on Natural Analogues

16. EPRI Workshop on the Role of Analogue Information in the Evaluation of a Potential Site for a Radioactive Waste Repository, presented by John Kessler [**Viewgraphs**]

MEETING NOTEBOOK CONTENTS

TAB NUMBER

DOCUMENTS

Opening Statement by ACNW Chairman

1. Agenda, 147th ACNW Meeting, November 19–20, 2003, dated October 31, 2003
2. Introductory Statement by ACNW Chairman, Wednesday, November 19, 2003, undated
3. Items of Interest for 147th ACNW Meeting, undated
4. Introductory Statement by ACNW Chairman, Thursday, November 20, 2003, undated

3

Yucca Mountain Program Status

5. Status Report
6. Memo from A. Christianne Ridge and Jon Peckenpaugh, to Andy Campbell, ACNW, Subject: Trip Report: NWTRB Meeting September 16-17, 2003, in Amargosa Valley, NV, Tour of Yucca Mountain, September 18, 2003, Tour of Amargosa Valley, NV, September 19, 2003

4

Repository Design Status

7. Status Report

5

Department of Energy Approach to Drift Degradation Analyses

8. Status Report

8

Igneous Activity Status Report

9. Status Report with Attachments *Internal Committee Use Only*

11

Electric Power Research Institute Workshop on Natural Analogues

10. Status Report
11. EPRI Workshop Announcement, The Role of Natural Analogues in the Evaluation of the Adequacy of a Potential Site for a Radioactive Waste Repository, October 9-10, 2003

MEETING NOTEBOOK CONTENTS

**TAB
NUMBER**

DOCUMENTS

11 (cont'd) Electric Power Research Institute Workshop on Natural Analogues (Cont'd)

12. EPRI Workshop: The Role of Natural Analogues in the Evaluation of the Adequacy of a Potential Site for a Radioactive Waste Repository, October 9-10, 2003, Final Agenda

Tour

ACNW AMARGOSA VALLEY BUS TOUR

13. Itinerary
14. NUREG-1538, Appendix A, "Overview of Farming and Ranching Activities in the Yucca Mountain Area," prepared by Eisenberg, Lee, Coleman, and Glenn in 2001
15. NUREG-1538, Appendix B, "Lifestyles and Water Use Practices In and Around the Nevada Test Site Before Its Establishment: A Preliminary Evaluation," prepared by Lee, McKague, and Presholt in 2001
16. Amargosa Valley Fact Sheet