



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Reply to:

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Tel: (702) 388-6125

TO: Robert M. Bernero, Director
NMSS (M/S 6 E 6)

THRU: B. Joe Youngblood, Director
Division of High-Level Waste Management

FROM: Philip S. Justus *Philip S. Justus*
On-Site Licensing Representatives Office

DATE: NOVEMBER 18, 1992

SUBJECT: STATE OF NEVADA REFERENCE TO YOUR SEISMIC DESIGN
CONSIDERATIONS PAPER PRESENTED AT AMERICAN SOCIETY OF CIVIL
ENGINEERS (ASCE) MEETING HELD IN AUGUST, 1992

Enclosed for your information is a copy of the State of Nevada presentation to the Advisory Committee on Nuclear Waste made by Carl Johnson on October 21st, in Las Vegas.

Mr. Johnson refers to your ASCE paper, "the State's position appears to be supported by the NRC as evidenced by some of the statements of Robert Bernero, NRC, in his recent paper..." (pp. 12-13), and quotes a few statements (pp 12-16).

I thought this feedback would be of interest to you. No response is requested.

Enclosure: As stated *on the shelf - 45 12 1992*

cc: Joe Holonich, Director, HLPD; w/o enc. (M/S 4 H 3)

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Rec'd. via letter cited
11/18/92 Refers/quotes R. Bernero's
92 11252296 92/118 ASCE paper. See pp. 12-16.

CARL A. JOHNSON

STATE OF NEVADA

PRESENTATION TO:

**THE U.S. NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE**

LAS VEGAS

OCTOBER 21, 1992

STATE OF NEVADA'S REGULATORY ROLE

THE STATE OF NEVADA, THROUGH THE NUCLEAR WASTE PROJECT OFFICE, HAS THE MISSION TO PROTECT THE INTERESTS OF THE CITIZENS OF NEVADA, BOTH PRESENT AND FUTURE, USING EVERY REGULATORY REQUIREMENT THAT APPLIES.

THE FEDERAL DOE, NRC AND EPA ORDERS AND REGULATIONS WILL BE USED AS MINIMUM GUIDANCE BECAUSE OF A LACK OF THE STATE'S OWN SPECIFIC REGULATIONS DEALING WITH THE SITING OF THE HIGH LEVEL NUCLEAR WASTE REPOSITORY.

HOWEVER, THE STATE DOES NOT FEEL BOUND BY ANY OF THE FEDERAL REGULATORY STAFF POSITIONS AND CAN AND WILL INTERPRET THE REGULATIONS AS WE SEE FIT BASED ON WHATEVER PAST LEGAL PRECEDENTS THAT HAVE BEEN SET IN

**LICENSING OTHER NUCLEAR AND HAZARDOUS WASTE FACILITIES
UNDER THE 1954 ATOMIC ENERGY ACT AND NEPA.**

ALTHOUGH SMALL IN NUMBER, THE SCIENTISTS AND ENGINEERS WHO ADVISE THE STATE ARE IN EVERY WAY THE PROFESSIONAL EQUALS TO THOSE WORKING FOR THE DOE, NRC, AND EPA. THE QUESTIONS THAT ARE RAISED BY THE STATE'S ADVISORS ARE BASED ON THEIR OWN INDEPENDENT INTERPRETATION OF THE REGULATIONS AND THE DATA THAT HAS BEEN PROVIDED TO THEM. THESE QUESTIONS SHOULD NOT BE CONSIDERED IN ANY WAY FRIVOLOUS OR CONTRIVED. THE QUESTIONS ARE PROFESSIONALLY MOTIVATED AND DESERVE TO BE ANSWERED PROFESSIONALLY IN A TIMELY MANNER.

10 CFR 100, APPENDIX A., 10 CFR 60

RELATIVE TO 10 CFR 100, APPENDIX A, NRC, DOE, AND THE UTILITIES SEEM TO HAVE MISSED THE POINT IN THE STATE'S PREVIOUS REMARKS. IT IS THE STATE'S POSITION

AND APPARENTLY IS STILL THE NRC STAFF'S POSITION, THAT THE PRINCIPLES, PHILOSOPHY, AND GUIDANCE CONTAINED WITHIN 10 CFR 100, APPENDIX A, FOR CONDUCTING GEOLOGIC INVESTIGATIONS IS UNIVERSALLY APPLICABLE TO THE CHARACTERIZATION OF ANY PROPOSED NUCLEAR FACILITY SITE.

EXPERIENCED PROFESSIONAL GEOLOGISTS WILL NOT INVESTIGATE A SITE ANY DIFFERENTLY FOR ONE TYPE OF NUCLEAR FACILITY VERSUS ANOTHER. THE PERCEPTION OF RISK DOES NOT ENTER INTO THE INVESTIGATION PROCESS.

THE MAJORITY OF GEOLOGISTS WHO WORKED ON NUCLEAR POWER SITES NEVER SAW A REACTOR OR KNEW ANYTHING ABOUT HOW THE SYSTEMS MIGHT RESPOND TO GEOLOGIC HAZARDS.

IT IS ALSO VERY UNLIKELY THAT THE MAJORITY OF GEOLOGISTS WORKING ON THIS PROGRAM WILL EVER SEE THE OPERATION OF A FEDERALLY LICENSED UNDERGROUND NUCLEAR

WASTE REPOSITORY OR EVEN HAVE ANY SIGNIFICANT EXPOSURE TO THE DESIGN BEFORE THE GEOLOGICAL INVESTIGATIONS ARE COMPLETE.

CONVERSELY, FEW IF ANY OF THE DESIGN ENGINEERS INVOLVED WITH NUCLEAR PROGRAMS HAD OR PRESENTLY HAVE ANY REAL UNDERSTANDING OR APPRECIATION OF THE DEPTH OF GEOLOGIC STUDIES THAT ARE REQUIRED TO PROVIDE DEFENDABLE INPUT DATA TO THE ENGINEERS, PARTICULARLY IN THE AREA OF ESTABLISHING THE DESIGN EARTHQUAKE(S).

THERE HAS ALWAYS BEEN A RUSH ON THE PART OF THE ENGINEERS AND PROGRAM MANAGERS TO PROCEED WITH DESIGN AND CONSTRUCTION BEFORE CRITICAL GEOLOGIC DATA IS AVAILABLE. THE RECORD IS FULL OF EXAMPLES FROM THE NUCLEAR POWER PLANT SITING DAYS, WHERE A PREMATURE SELECTION OF THE SEISMIC DESIGN PARAMETERS WERE MADE BY THE ENGINEERS IN ORDER TO PROCEED WITH DESIGN. ONCE THE INITIAL GEOLOGIC WORK WAS COMPLETED

(SOMETIMES EVEN BEFORE IT WAS COMPLETED), THE ENGINEERS ALWAYS FORCED THE GEOLOGISTS INTO COMING UP WITH A PRELIMINARY ESTIMATE OF THE "MAGIC NUMBER" - PEAK GROUND ACCELERATION IN THE FREE FIELD. ON MORE THAN ONE OCCASION, BECAUSE THE GEOLOGIST WOULD HAVE A TENDENCY TO BE VERY CONSERVATIVE AT THE PRELIMINARY STAGE, THE DESIGN EARTHQUAKE VALUE WAS PICKED OUT OF THE AIR BY THE ENGINEERS AND THEN THE GEOLOGISTS WERE EXPECTED TO GO OUT AND FIND THE DATA TO SUPPORT IT. IF ADDITIONAL GEOLOGIC WORK WAS INADEQUATE OR THE RESULTS DID NOT SUPPORT THE PRECONCEIVED ENGINEER'S NOTIONS AND IT WAS DETERMINED THAT THE SEISMIC DESIGN HAD TO BE INCREASED IN ORDER TO SATISFY REGULATORY CONCERN, THE GEOLOGISTS THEN BECAME THE BAD GUYS. THE CLIENT (APPLICANT) THEN COMPLAINS ABOUT THE GEOLOGISTS EVER BEING ABLE TO REACH A DECISION OR THAT THEY ARE BEING UNFAIRLY TREATED BY THE REGULATORS. THE END RESULTS ARE ALWAYS THE SAME, THE TAXPAYER (RATEPAYER) TAKES IT IN THE SHORTS. THE ENGINEERS ON THE OTHER

HAND SCREAM ALL THE WAY TO THE BANK EVERY TIME THEY GO BACK AND DO A REDESIGN! EUPHEMISTICALLY, THIS APPROACH HAS COME TO BE CALLED THE BECHTEL APPROACH BECAUSE THEY HAVE HAD THE MOST SUCCESS IN APPLYING IT.

IF YOU CALCULATE THE PERCENTAGE OF "WORKING" EARTH SCIENTISTS VERSUS THE PERCENTAGE OF POLITICIANS, MANAGERS, ENGINEERS, QUALITY ASSURANCE PEOPLE, AND OTHER NON-PRODUCTIVE MEMBERS OF THE DOE'S PROGRAM, YOU MAY BEGIN TO UNDERSTAND WHY THE STATE FEELS THAT THE YUCCA MOUNTAIN PROJECT APPEARS TO BE ANOTHER EXAMPLE OF THIS PHENOMENA IN THE MAKING.

THOSE FEW OF US WHO HAVE BEEN THROUGH THE NUCLEAR POWER PLANT SITING WARS, BELIEVE THAT THE DOE'S HEADLONG CHARGE TO GET UNDERGROUND WITHOUT FIRST COMING TO GRIPS WITH THE FORMIDABLE GEOLOGIC ISSUES OF HOW TO DEAL WITH DETERMINING SEISMIC DESIGN IN THE NEAR FIELD AND FAULT DISPLACEMENT EFFECTS ON POST-

CLOSURE PERFORMANCE, TO BE VERY POOR PLANNING. WE ALSO FEEL THAT TO CONSIDER THE FUTURE EXPENDITURE OF SEVERAL BILLIONS OF DOLLARS ON A PROJECT WHICH AT THIS POINT APPEARS TO BE DOOMED TO ALMOST CERTAIN LICENSING FAILURE, IS INCREDIBLY IRRESPONSIBLE. ANYONE WHO BELIEVES THAT THE DOE AND NRC WILL NOT BE SEVERELY CHALLENGED ON THESE ISSUES IF THE PROCESS EVER REACHES THE LICENSING STAGE IS INCREDIBLY NAIVE.

CONTINUING ON WITH THE DISCUSSION OF 10 CFR 100, APPENDIX A. WHERE PERHAPS, FOR DIFFERENT REASONS, ALL PARTIES ESSENTIALLY AGREE - IS THAT THE RESULTS OF THESE GEOLOGIC INVESTIGATIONS RECOMMENDED BY 10 CFR 100, APPENDIX A, SHOULD NOT BE APPLIED EQUALLY TO ESTABLISHING THE DESIGN BASIS FOR ALL TYPES OF NUCLEAR FACILITIES. IT IS OBVIOUS THAT THE ISSUE OF DESIGNING TO ACCOMMODATE DISPLACEMENT FOR SURFACE WASTE HANDLING FACILITIES IS SUBSTANTIALLY DIFFERENT THAN THE ISSUE OF DESIGNING TO ACCOMMODATE FAULT DISPLACEMENT WITHIN

THE REPOSITORY DURING THE POST CLOSURE PERIOD. IN THE CASE OF THE SURFACE FACILITIES, IF THE DESIGN GETS TESTED BY THE OCCURRENCE OF A LITTLE SKULL MOUNTAIN OR LARGER TYPE EARTHQUAKE ON THE MIDWAY VALLEY FAULT, ANY ADVERSE RESULTS WOULD BE IMMEDIATE AND COULD POSSIBLY BE RECOVERED FROM. IN THE CASE OF THE REPOSITORY DURING THE POST CLOSURE PERIOD, THE RESULTS WOULD NOT NECESSARILY BE IMMEDIATE NOR DETECTABLE. ANY ADVERSE IMPACT MIGHT NOT SHOW UP FOR HUNDREDS TO THOUSANDS OF YEARS, LONG AFTER THE RECENT CONGRESSIONALLY MANDATED 10,000-YEAR POST CLOSURE MONITORING PROGRAM HAD BEEN TERMINATED BECAUSE OF LACK OF FUNDING, LACK OF INTEREST, OR ANOTHER AMENDMENT TO THE 1982 NWPA.

10 CFR 960 AND DOE ORDER 6430.1A

10 CFR 960 "HIGH LEVEL WASTE REPOSITORY SITING GUIDELINES" AND DOE ORDER 6430.1A "GENERAL DESIGN CRITERIA (FOR NON-REACTOR FACILITIES)" ARE OSTENSIBLY

THE INTERNAL FOUNDATION FOR THE DOE'S PROGRAM AS OUTLINED IN THE SCP. THE ISSUE RESOLUTION STRATEGY FOUND IN THE SCP IS SUPPOSEDLY DICTATED IN PART BY SOME NEED TO PROVIDE A HIGHER LEVEL FINDING TO SATISFY THESE SELF IMPOSED REQUIREMENTS. ALTHOUGH THE STATE FEELS THAT IF THE DOE HAD FOLLOWED THEIR GUIDELINES IN THE FIRST PLACE, THE YUCCA MOUNTAIN SITE WOULD NOT HAVE BEEN SELECTED, WE ARE PROBABLY PAST THE POINT OF NO RETURN.

WHERE THE STATE OF NEVADA CONTINUES TO DISAGREE WITH THE DOE IS IN THE TIMING OF WHEN ENOUGH OF THE RESULTS FROM ONGOING AND PLANNED FUTURE ACTIVITIES WILL BE AVAILABLE TO AGAIN EVALUATE THE SUITABILITY OF THE SITE UNDER 10 CFR 960. WITH THE ADVENT OF THE LITTLE SKULL MOUNTAIN EARTHQUAKE AND THE DISCOVERY THAT THE SOLITARIO CANYON FAULT IS ACTIVE AND THAT THERE IS NOT AS MUCH ROOM FOR WASTE CANISTERS IN THE REPOSITORY AS PREVIOUSLY THOUGHT DUE TO THE BELATED

DISCOVERY THAT THE GHOST DANCE FAULT IS 800 FEET WIDE, THESE WOULD SEEM TO BE MORE THAN ENOUGH NEW INFORMATION TO CAUSE REVISITING OF 10 CFR 960. PERHAPS THE ISSUE OF SITE SUITABILITY COULD BE ESTABLISHED USING THE NRC'S FORMAL PROCEDURES GOVERNING EARLY SITE REVIEW SUCH AS SAN DIEGO GAS & ELECTRIC USED AT SUNDESERT, CALIFORNIA, OR PORTLAND GENERAL ELECTRIC USED AT BORDMAN, OREGON.

IF THE DOE IS TO PROCEED WITH THEIR PROGRAM WITHOUT A FORMAL REGULATORY REVIEW THEN THE STATE OF NEVADA FEELS THAT THE DOE MUST, AT A MINIMUM, PROVIDE ADEQUATE STUDY PLANS BASED ON ALL AVAILABLE DATA (WHETHER IT MEETS DOE'S QUALITY ASSURANCE STANDARDS OR NOT), WITH ACCEPTABLE RESOLUTION OF COMMENTS, PRIOR TO INITIATING ANY SUBSTANTIVE DESIGN OR UNDERGROUND CONSTRUCTION. THIS IS A LONGSTANDING COMMITMENT THAT DOE MADE AT THE TIME OF THE SCP SUBMITTAL AND WE EXPECT THAT COMMITMENT TO BE HONORED. IN ADDITION, WE

SUGGEST THAT IT WOULD BE PRUDENT FOR THE DOE TO HAVE COMPLETED ENOUGH OF THE APPROPRIATE STUDIES TO ESTABLISH SOME MODEST LEVEL OF CREDIBILITY BEFORE BEING ALLOWED TO PROCEED UNDERGROUND.

IF THE DOE IS ABLE TO FOLLOW THE AMBITIOUS SCHEDULE PUT FORTH IN THE AUGUST 14, 1992, MEMO FROM GERTZ TO BARTLETT RELATIVE TO AN ACCELERATED SEISMIC PROGRAM, THE EARLIEST TIME THAT SEISMIC STUDIES COULD BE ACCOMPLISHED WOULD BE SEPTEMBER, 1995. THIS SCHEDULE COULD BE MET ONLY IF THERE ARE NOT ANY NEW GEOLOGIC SURPRISES PRODUCED FROM THE SURFACE BASED FIELD INVESTIGATIONS PROGRAMS, AND THERE IS AN EXPEDITIOUS RESOLUTION OF THE MAJOR DIFFERENCES IN INTERPRETATION THAT WILL SURELY ARISE FROM SUCH NEW DATA.

THE STATES' POSITION APPEARS TO BE SUPPORTED BY THE NRC AS EVIDENCED BY SOME OF THE STATEMENTS OF

ROBERT BERNERO, NRC, IN HIS RECENT PAPER AT THE ASCE SYMPOSIUM ON SEISMIC DESIGN CONSIDERATIONS FOR THE HIGH LEVEL NUCLEAR WASTE REPOSITORY, HELD AUGUST 19-20, 1992, IN SAN FRANCISCO.

" . . . DESIGNING FOR FAULT DISPLACEMENT IS ANOTHER MATTER. THE CURRENT STATE OF THE ART DICTATES THAT CAUTION MUST BE USED IN DECIDING TO DESIGN FACILITIES TO ACCOMMODATE FAULT DISPLACEMENT."

" . . . IF DOE DECIDES TO LOCATE STRUCTURES IMPORTANT TO SAFETY NEAR KNOWN FAULTS, IT WILL HAVE TO DEMONSTRATE THAT SUCH A DESIGN CAN MEET THE PERFORMANCE OBJECTIVES OF 10 CFR PART 60, WITH REASONABLE ASSURANCE."

"THE REAL PROBLEM IS WHETHER IT IS POSSIBLE TO DEMONSTRATE TO THE NRC STAFF, AND TO CONVINCE

THE TECHNICAL COMMUNITY AND THE INTERESTED PARTIES THAT SUCH A DESIGN IS SAFE AGAINST LARGE OR REPEATED FAULT DISPLACEMENTS, CONSIDERING BOTH NEAR-TERM (OPERATIONAL) AND LONG-TERM (DISPOSAL) SAFETY PERFORMANCE."

"THE KEY REQUIREMENT FROM NRC'S PERSPECTIVE IS THAT THE DESIGN FOR FAULT DISPLACEMENT MUST PROVIDE REASONABLE ASSURANCE OF MEETING PERFORMANCE OBJECTIVES. WE RECOMMEND THAT IF THE DOE CONTEMPLATES DESIGNING FOR FAULT DISPLACEMENT, IT WOULD BE ADVISABLE FOR DOE TO RESOLVE THE ADEQUACY OF SUCH A DESIGN WITH THE NRC STAFF AND OTHER AFFECTED PARTIES, AS SOON AS POSSIBLE (EMPHASIS ADDED)."

BERNERO GOES ON TO STATE IN HIS CLOSING REMARKS THAT:

**"WE HAVE ONLY LOOKED AT THE DESIGN ISSUES
RELATED TO THE SEISMIC AND FAULT DISPLACEMENT
CONSIDERATIONS. HOWEVER, THERE ARE LARGER
ISSUES RELATED TO THE DEMONSTRATION OF
COMPLIANCE WITH PRE- AND POST-CLOSURE
PERFORMANCE OBJECTIVES.**

AMONG THE QUESTIONS THAT NEED TO BE ANSWERED:

**HOW COULD EARTHQUAKES AND FAULT
DISPLACEMENTS PRODUCE CHANGES IN THE
FRACTURE CHARACTERISTICS DURING THE
10,000-YEAR POST-CLOSURE?**

**HOW COULD TECTONIC AND VOLCANIC EFFECTS
INFLUENCE WATER TABLE AND HYDRAULIC
GRADIENTS?**

**"HOW CAN THESE PHENOMENA AFFECT THE
GEOLOGIC REPOSITORIES PERFORMANCE OVER
10,000 OR MORE YEARS?"**

**BERNERO FINALLY STATES, ". . . THE REAL CHALLENGE
LIES IN ATTEMPTING TO FIND CONVINCING ANSWERS TO THESE
QUESTIONS."**

**THE STATE OF NEVADA FEELS THAT THE REAL CHALLENGE
IS FOR THE DOE TO COME UP WITH A CONVINCING PLAN FOR
ACQUIRING THE NECESSARY PHYSICAL DATA THAT EVERYONE
FEELS WILL BE NEEDED TO PROVIDE ANSWERS TO THE
QUESTIONS BEFORE PROCEEDING UNDERGROUND. SO FAR THE
RECORD OF THE DOE IN PRODUCING USEFUL STUDY PLANS HAS
NOT EXACTLY BEEN EXEMPLARY.**

SITE CHARACTERIZATION PLAN (SCP) - DECEMBER, 1988

AS FAR AS THE STATE OF NEVADA IS CONCERNED, THE SCP IS STILL THE ONLY OFFICIAL BASIS FOR DOE'S ONGOING PROGRAM. STATEMENTS OF "FACT", COMMITMENTS TO FUTURE ACTIONS (E.G., STUDY PLANS, SCHEDULES, UNDERGROUND FACILITIES DESIGN, ETC.) ARE BINDING UNTIL OFFICIALLY CHANGED BY THE DOE AND ACCEPTED BY ALL PARTIES.

THERE ARE A NUMBER OF OBJECTIONS, COMMENTS, AND QUESTIONS BY BOTH THE STATE AND NRC THAT ARE STILL UNRESOLVED.

PERIODIC PRESENTATIONS TO ACNW, NWTRB, THE EARLY SITE SUITABILITY REPORT (ESSE), ABSTRACTS AT PROFESSIONAL MEETINGS, UNREFEREED PAPERS AT DOE-SPONSORED MEETINGS SUCH AS THE INTERNATIONAL HIGH-LEVEL WASTE CONFERENCE AND PUBLIC RELATIONS-STYLE UPDATE MEETINGS IN SUCH

PLACES AS PAHRUMP OR ARMAGOSA VALLEY ARE NOT A SUBSTITUTE FOR RESPONSE TO THE CONCERNS ABOUT THE SCP?

THERE ARE A SIGNIFICANT NUMBER OF KEY STUDY PLANS YET TO BE RELEASED IN ANY FORM. THOSE THAT HAVE BEEN OFFICIALLY RELEASED IGNORE THE COMMENTS THAT THE STATE HAS PROVIDED OR GIVE LIP SERVICE RECOGNITION AT BEST. SUBSEQUENTLY, THE PROGRAMS PROCEED WITHOUT ANY SATISFACTORY RESOLUTION OR ACCOMMODATION. I SENSE A SIMILAR SITUATION BETWEEN THE NRC AND DOE RELATIVE TO STUDY PLANS.

SOME EXAMPLES OF WHAT THE STATE FEELS IS STILL THE DOE OFFICIAL POSITION OF RECORD AS STATED IN THE SCP ARE:

SCP 1-1

"GEOLOGICALLY MEANINGFUL REGION HAS PROVED TO BE SOUTHERN GREAT BASIN."

SCP 1-5

"UNCERTAINTIES IMPEDE RELIABLE ESTIMATES OF THE MAGNITUDE, RECURRENCE INTERVALS, AND GROUND MOTION FROM FUTURE EARTHQUAKES THAT ARE TO BE CONSIDERED IN THE DESIGN AND PERFORMANCE."

SCP 1-6

"TO ADEQUATELY DESIGN THE REPOSITORY AND ASSESS ITS ULTIMATE PERFORMANCE A TECTONIC MODEL OR MODELS MUST BE DEVELOPED THAT INCORPORATE AND LOGICALLY RELATE ALL PERTINENT GEOLOGIC AND SEISMOLOGIC INFORMATION THAT HAVE A TECTONIC IMPLICATION."

SCP 1-96

"THE BASALTS NEAR YUCCA MOUNTAIN ERUPTED NEAR, IN ASSOCIATION WITH, FAULTS, RIFTS AND FRACTURE ZONES, WHICH STRONGLY SUGGESTS STRUCTURAL CONTROL OF VOLCANISM."

SCP 1-111

"YUCCA MOUNTAIN IS IN THE WALKER LANE, A NORTHWEST-TRENDING BELT OF RIGHT-LATERAL FAULTS THAT DISRUPTS THE REGIONAL STRUCTURAL GRABEN."

SCP 1-207

"FAULTING COULD EITHER DIRECTLY OR INDIRECTLY AFFECT THE HYDROLOGIC SYSTEMS, GEOCHEMISTRY, AND (OR) ROCK CHARACTERISTICS OF YUCCA MOUNTAIN."

NEAR FIELD FAULTS

TWO NEW PIECES OF INFORMATION ON THE SOLITARIO CANYON AND GHOST DANCE FAULTS THAT HAVE COME TO LIGHT RECENTLY ARE GOOD EXAMPLES OF WHY THE STATE FEELS THAT EVEN TO CONSIDER PROCEEDING WITH THE DESIGN OF THE ESF LET ALONE WITH THE CONSTRUCTION IS PREMATURE.

THE SOLITARIO CANYON FAULT AND
NEAR FIELD VIBRATORY GROUND MOTION

THE SOLITARIO CANYON FAULT THAT BOUNDS THE WEST SIDE OF THE PROPOSED REPOSITORY BLOCK APPEARS TO HAVE POSITIVE EVIDENCE OF HOLOCENE DISPLACEMENT. THIS EVIDENCE, ALONG WITH PREVIOUSLY OBTAINED EVIDENCE OF HOLOCENE DISPLACEMENT ON THE WINDY WASH FAULT, STRONGLY SUGGESTS THAT ALL OF THE FAULTS IN, AROUND, AND THROUGH YUCCA MOUNTAIN MUST BE CONSIDERED AS POTENTIAL SOURCES FOR FUTURE EARTHQUAKES AND/OR DISPLACEMENT. THESE FAULTS ARE BY NRC DEFINITION, TYPE I FAULTS AND NEED TO BE INVESTIGATED IN DETAIL AND THE RESULTS MADE AVAILABLE BEFORE DOE PROCEEDS MUCH FARTHER WITH THE ESF.

THIS RECENT DISCOVERY OF HOLOCENE ACTIVITY ON THE SOLITARIO CANYON FAULT AND THE (SUDDEN) WIDENING OF THE GHOST DANCE FAULT BRINGS UP A COUPLE OF NEW

*information announced
that this was all over.*

INTERESTING PROBLEMS FOR THE DOE RELATED TO ESTABLISHING ACCEPTABLE DESIGN PARAMETERS.

TO OUR KNOWLEDGE, THERE IS NO PROVEN TECHNIQUE FOR ESTABLISHING VIBRATORY GROUND MOTION IN THE NEAR FIELD FOR CRITICAL STRUCTURES. THE ENGINEERS TELL US THAT THEY CAN DESIGN FOR DISPLACEMENT OR STRONG VIBRATORY GROUND MOTION IN THE NEAR FIELD AS LONG AS THEY DO NOT OCCUR AT THE SAME TIME. THE ENGINEERS ALSO TELL US THAT NEITHER THE DESIGN FOR FAULT DISPLACEMENT OR THE DESIGN FOR NEAR FIELD VIBRATORY GROUND MOTION HAVE EVER BEEN TESTED.

THIS MAY COME AS A SURPRISE BUT THE STATE DOES NOT FEEL THAT THE SEISMIC DESIGN ISSUE OF VIBRATORY GROUND MOTION IN THE NEAR FIELD AS IT MIGHT EFFECT THE OPERATING FACILITIES, BOTH SURFACE AND UNDERGROUND, IS THE MOST SERIOUS PROBLEM THAT MUST BE DEALT WITH. THE SEISMIC DESIGN ISSUE OF VIBRATORY GROUND MOTION IN THE

NEAR FIELD, AS IT EFFECTS OPERATING FACILITIES, IS CERTAINLY GOING TO BE ONE OF THE MORE VOLATILE ISSUES THAT WILL NEED TO BE FACED, BUT IT IS POTENTIALLY TRACTABLE. THERE IS ONE EXCEPTION, HOWEVER, THAT IS FAULT DISPLACEMENT. NO NUCLEAR FACILITY IN THE U.S. HAS EVER BEEN LICENSED FOR CONSTRUCTION THAT WAS KNOWN TO HAVE ACTIVE FAULTS RUNNING THROUGH OR IN CLOSE PROXIMITY TO THE CATEGORY I STRUCTURES. THE STATE OF NEVADA FINDS IT DIFFICULT TO IMAGINE THAT THE DOE IS CAPABLE OF DEMONSTRATING WITH "REASONABLE ASSURANCE" THAT THE PROPOSED YUCCA MOUNTAIN REPOSITORY, THE NATION'S FIRST REPOSITORY, SHOULD ALSO BE THE FIRST EXCEPTION.

GIVEN THAT THE DOE MAY SOMEHOW INADVERTENTLY CONVINCE THE NRC AND/OR CONGRESS, THAT THE SEISMIC DESIGN ISSUE CAN BE RESOLVED, LET US MOVE ON TO WHAT THE STATE CONSIDERS TO BE AN EVEN MORE DIFFICULT ISSUE

TO ADDRESS, THAT IS THE SPATIAL PROBLEM AND POST-CLOSURE PERFORMANCE.

THE GHOST DANCE FAULT AND PERFORMANCE

THE RECENT DISCOVERY BY THE U.S. GEOLOGICAL SURVEY THAT THE GHOST DANCE FAULT ZONE RUNNING THROUGH THE PROPOSED REPOSITORY BLOCK IS UP TO 800 FEET WIDE BRINGS UP A NUMBER OF OBVIOUS QUESTIONS THAT THE STATE FEELS THE DOE SHOULD BE PREPARED TO ANSWER BEFORE BEING ALLOWED TO PROCEED WITH THE ESF.

- (1) THE DOE NEEDS TO EXPLAIN HOW AND WHY AN 800 FOOT WIDE FAULT ZONE RUNNING THROUGH THE REPOSITORY WAS OVERLOOKED IN THE PROCESS OF SELECTING YUCCA MOUNTAIN AND DEVELOPING THE SCP. REMEMBER THE 800 FOOT WIDTH IS THE WIDTH MAPPED, THE FAULT ZONE COULD BE WIDER.

- (2) THE DOE NEEDS TO DEMONSTRATE THAT THE OTHER SIGNIFICANT FAULTS THAT ARE IN THE IMMEDIATE VICINITY SUCH AS SOLITARIO CANYON FAULT DO NOT ALSO HAVE WIDE ZONES OF DEFORMATION THAT HAVE SOMEHOW GONE UNDETECTED.
- (3) THE DOE NEEDS TO PROVIDE AN ACCEPTABLE PLAN FOR CHARACTERIZING THE VERTICAL AND LATERAL EXTENT AND CHARACTER OF THESE WIDE FAULT ZONES AT DEPTHS BETWEEN THE REPOSITORY BLOCK AND THE SATURATED GW SYSTEM.
- (4) THE DOE NEEDS TO PROVIDE AN ACCEPTABLE PLAN ON HOW THEY EXPECT TO DETERMINE THE EFFECT ON THE HYDROLOGICAL REGIME THAT FUTURE DISPLACEMENT ON THESE FAULTS WILL HAVE.
- (5) THE DOE NEEDS TO DEMONSTRATE THAT THERE WILL STILL BE ADEQUATE ROOM WITHIN THE EXISTING PROPOSED

REPOSITORY DESIGN TO ACCOMMODATE THE 70,000 MT OF SPENT FUEL AND HIGH-LEVEL WASTE WITH SOME CONTINGENCY ALLOWANCE FOR NEW FINDINGS IF AND WHEN THEY ARE ALLOWED TO PROCEED UNDERGROUND.

- (6) IN LIEU OF THE INAPPLICABILITY OF 10 CFR 100, APPENDIX A, THE DOE NEEDS TO PROVIDE AN ACCEPTABLE PLAN FOR DEVELOPING A DESIGN BASIS EARTHQUAKE THAT IS CONSISTENT WITH THEIR OWN REQUIREMENTS IN DOE ORDER 6430.1A AND ITS REFERENCES.

DOE SEISMIC HAZARDS ACTION PLAN

A SEPARATE MEETING WOULD BE REQUIRED TO REALLY DO JUSTICE TO THE PLAN. IN THE BRIEF TIME REMAINING, HOWEVER, WE WOULD LIKE TO ADDRESS A FEW IMPORTANT POINTS.

- (1) THE SCHEDULE LAID OUT IN THE PLAN CAN PROBABLY NOT BE MET, CERTAINLY IF DOE FOLLOWS THE STRATEGY THAT IS PROPOSED. BY NOT RECOGNIZING THE ROLE THAT THE STATE OF NEVADA WILL PLAY IN THE REGULATORY PROCESS AND THE TIME THAT HAS BEEN REQUIRED TO DATE TO GET STUDY PLANS IN PLACE, THE DOE IS UNDERESTIMATING THE SCHEDULE.
- (2) FOURTEEN OUT OF THE TWENTY-FOUR STUDIES SHOWN ON TABLE 3-1 OF THE PLAN HAVE EITHER NOT BEEN ISSUED IN ANY FORM OR ARE NOT VERY FAR THROUGH THE REVIEW PROCESS. THREE OF THE TEN STUDIES LISTED ON PAGE 2 OF THE MEMO, AS BEING UNDERWAY, HAVE NOT EVEN BEEN SEEN BY THE STATE. THE MEMO IS FURTHER MISLEADING IN THAT IT STATES THAT THERE ARE NINETEEN STUDIES ACTIVE, YET UPON CLOSER EXAMINATION, THE NINETEEN STUDIES ARE CONTAINED IN TEN OF THE TWENTY-FOUR STUDY PLANS REQUIRED TO ASSESS SEISMIC HAZARDS. IT IS UNKNOWN HOW MANY

STUDIES ARE CONTAINED IN THE REMAINING FOURTEEN STUDY PLANS, SINCE THEY HAVE YET TO BE ISSUED.

- (3) THE STATE'S CONFIDENCE IN THE FUTURE DIRECTION OF THE PROGRAM IS NOT BUOYED BY THE PROPOSAL TO FORM A TEAM OF EXPERTS IN SEISMIC HAZARDS ASSESSMENT BY THE USGS FOR THE PURPOSE OF ANALYZING THE PRESENT GEOLOGIC AND TECTONIC DATABASE AS WELL AS PROVIDING RECOMMENDATION ON GROUND MOTION ASSESSMENT MODELS. WE WOULD POINT OUT THAT THE USGS "EXPERTS" ARE PROBABLY SOME OF THE SAME PEOPLE WHO WERE RESPONSIBLE FOR HELPING TO DEVELOP THE SCP AND MAY HAVE PARTICIPATED IN THE EARLY SITE SUITABILITY EVALUATION. THESE USGS "EXPERTS" OVERLOOKED THE LICENSING SIGNIFICANCE OF MUCH OF THE DATA THAT WAS AVAILABLE AT THE TIME THE SCP WAS PREPARED (E.G., ACTIVITY ON THE SOLITARIO CANYON FAULT AND THE WIDTH OF THE GHOST DANCE FAULT).

(4) IF I COMPREHEND THE SCHEDULE CORRECTLY, THE SEISMIC HAZARDS ISSUE RESOLUTION WORKING GROUP WOULD HAVE TO BE WELL ALONG WITH THEIR WORK IF A TOPICAL REPORT IS TO BE AVAILABLE TO THE NRC AND THE STATE BY APRIL 1, 1993. IT IS NOT EVIDENT FROM THE PROPOSED ACTION PLAN THAT THE WORKING GROUP HAS AS YET RECOGNIZED SOME OF THE MOST IMPORTANT TECHNICAL CONCERNS. UNLESS THE ISSUES IDENTIFIED AS IMPORTANT BY THE STATE ARE FULLY ADDRESSED IN THE TOPICAL REPORT, RESOLUTION OF THE DIFFERENCES BY OCTOBER, 1993, IS HIGHLY UNLIKELY. IN ADDITION, THE PLAN TO USE SEMI-ANNUAL PROGRESS REPORTS, WHICH HAVE ALWAYS BEEN NINE TO TWELVE MONTHS OUT OF DATE, TO DOCUMENT CHANGES IN THE PROGRAM IS UNACCEPTABLE. ALSO, THE ACTION PLAN FAILS TO DISCUSS THE RELATIONSHIP OF THE SEISMIC HAZARD METHODOLOGY TOPICAL REPORT AND THE VARIOUS STUDY PLANS, WHICH ALSO DISCUSS METHODOLOGIES.

**(5) THE PROPOSED SEISMIC HAZARDS ACTION PLAN DOES NOT
APPEAR TO INCLUDE ANY CONSIDERATION OF:**

**A. THE EFFECTS OF NEAR-FIELD (LOCAL) VIBRATORY
GROUND MOTION AND DISPLACEMENT ON THE SITE
GEOLOGY.**

**B. THE DISCREET AND CUMULATIVE EFFECTS OF
DISPLACEMENT ON FRACTURE PERMEABILITY AND
THEREFORE PERFORMANCE.**

**C. THE CUMULATIVE EFFECT OF VIBRATORY GROUND
MOTION, BOTH REGIONAL AND LOCAL ON SEAL DESIGN
AND PERFORMANCE.**

**IF THE PROPOSED SEISMIC HAZARDS ACTION PLAN
SCHEDULE IS TO HAVE ANY CHANCE OF SUCCESS, WE STRONGLY
URGE THE DOE TO CONSIDER THE FOLLOWING
RECOMMENDATIONS:**

1. THE DOE SHOULD HOLD EARLY AND REGULAR MEETINGS WITH THE NRC, ACNW, AND NWTRB TO DISCUSS THE ACTION PLAN, THE REALTIME PROGRESS OF THE WORK AND THE RESULTS.
2. THE DOE SHOULD ENCOURAGE THE ATTENDANCE OF TECHNICAL OBSERVERS FROM THE NRC, NWTRB, AND THE STATE AT THE USGS SEISMIC HAZARDS GROUP AND SEISMIC HAZARDS ISSUE RESOLUTION GROUP MEETINGS.
3. THE DOE SHOULD IMMEDIATELY PROVIDE COPIES OF ALL STUDY PLANS IN WHATEVER FORM THEY NOW EXIST. IN ADDITION, THE FINAL STUDY PLANS APPROVED BY DOE SHOULD BE PROVIDED AT AN EARLY ENOUGH DATE TO RESOLVE SIGNIFICANT DIFFERENCES.

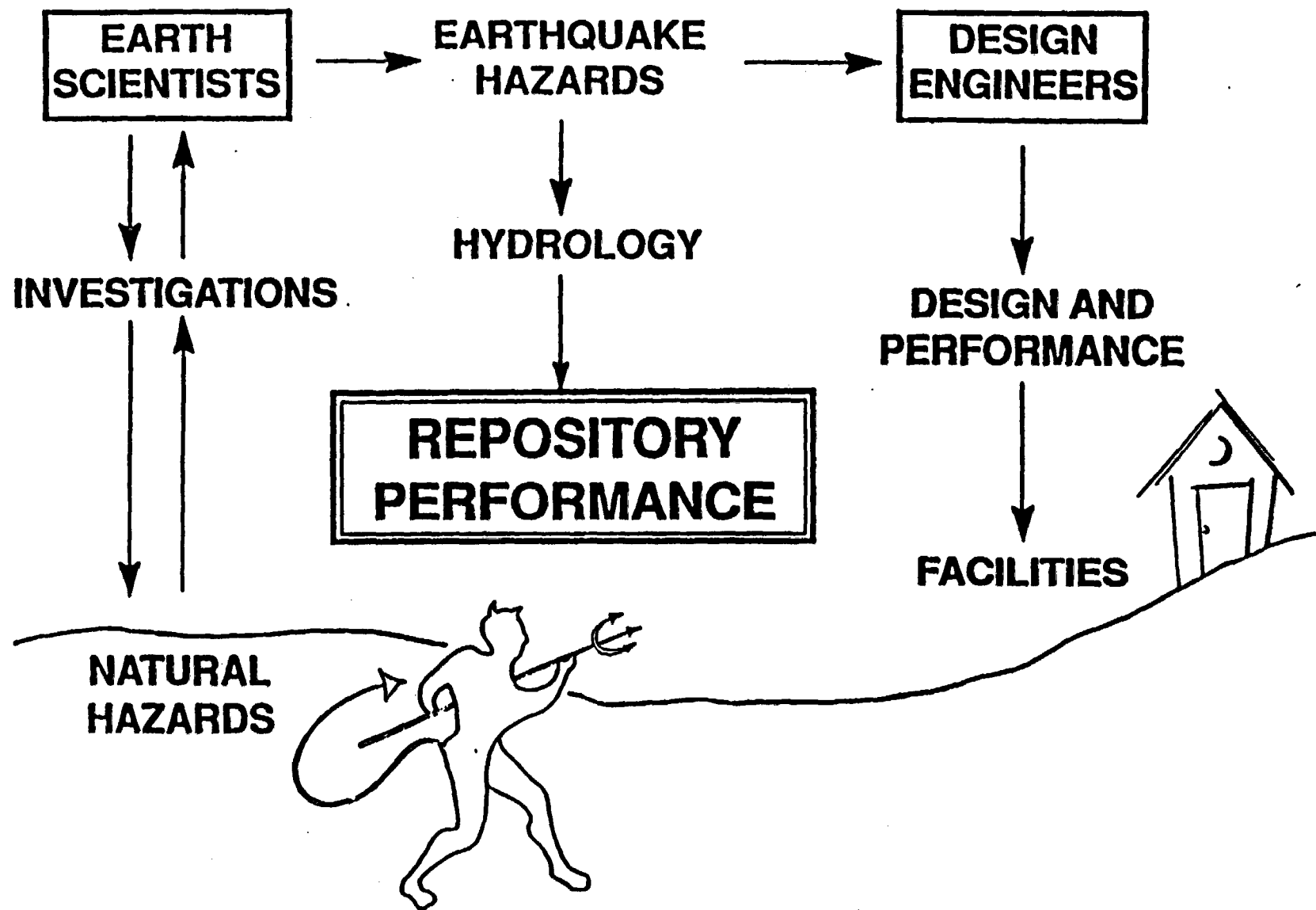
IF THE ACTION PLAN IS TO HAVE ANY CHANCE OF SUCCESS, THE DOE MUST RECOGNIZE AND ACCEPT THAT THE STATE DOES AND WILL PAY A SIGNIFICANT INDEPENDENT ROLE

IN THE REGULATORY PROCESS. THE ISSUES RAISED BY THE STATE ARE NOT TRIVIAL AND WE INSIST THAT THEY BE ADDRESSED IN A THOROUGH AND TIMELY MANNER BEFORE THE DOE IS ALLOWED TO PROCEED WITH SIGNIFICANT DEVELOPMENT OF THE ESF. ESF DEVELOPMENT AND CONSTRUCTION CANNOT PROCEED IN A PROFESSIONAL MANNER IN THE ABSENCE OF AN ESTABLISHED AND ACCEPTED SEISMIC DESIGN WHICH INCLUDES THE CONSIDERATION OF NEAR-FIELD EARTHQUAKE EVENTS.

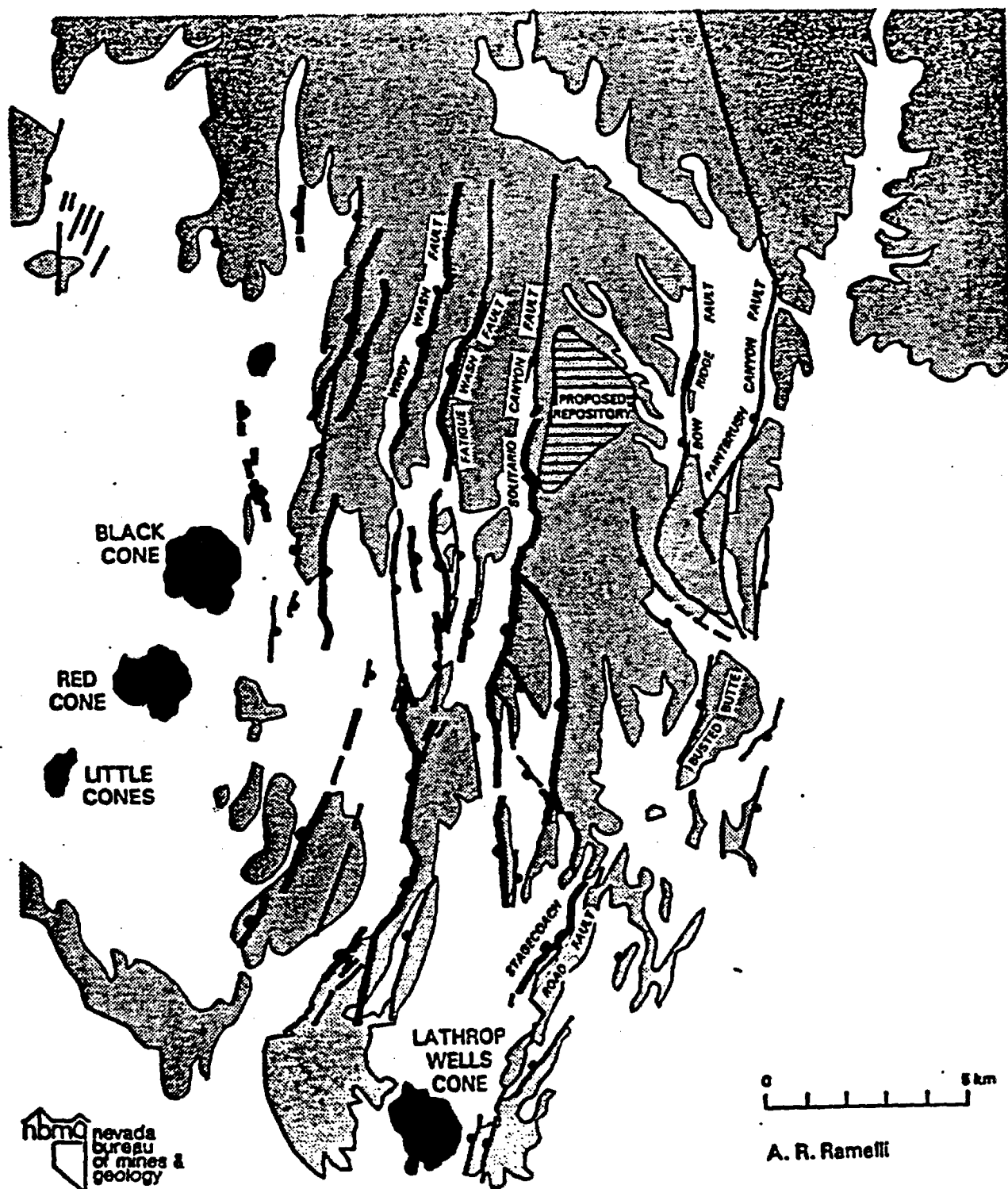
IT IS THE STATE'S POSITION THAT RESOLUTION OF THE PRINCIPLE ISSUE OF SITE SUITABILITY COULD BE RESOLVED NOW USING THE DATA THAT IS AVAILABLE. WHILE THE COLLECTION OF ADDITIONAL DATA FROM A SURFACE BASED TESTING PROGRAM WILL ADD CONFIDENCE TO THAT DECISION, NOTHING CAN BE GAINED BY PROCEEDING TO GO UNDERGROUND EXCEPT FOR THE UNNECESSARY EXPENDITURE OF SUBSTANTIAL TIME AND FUNDS.

TOPICS

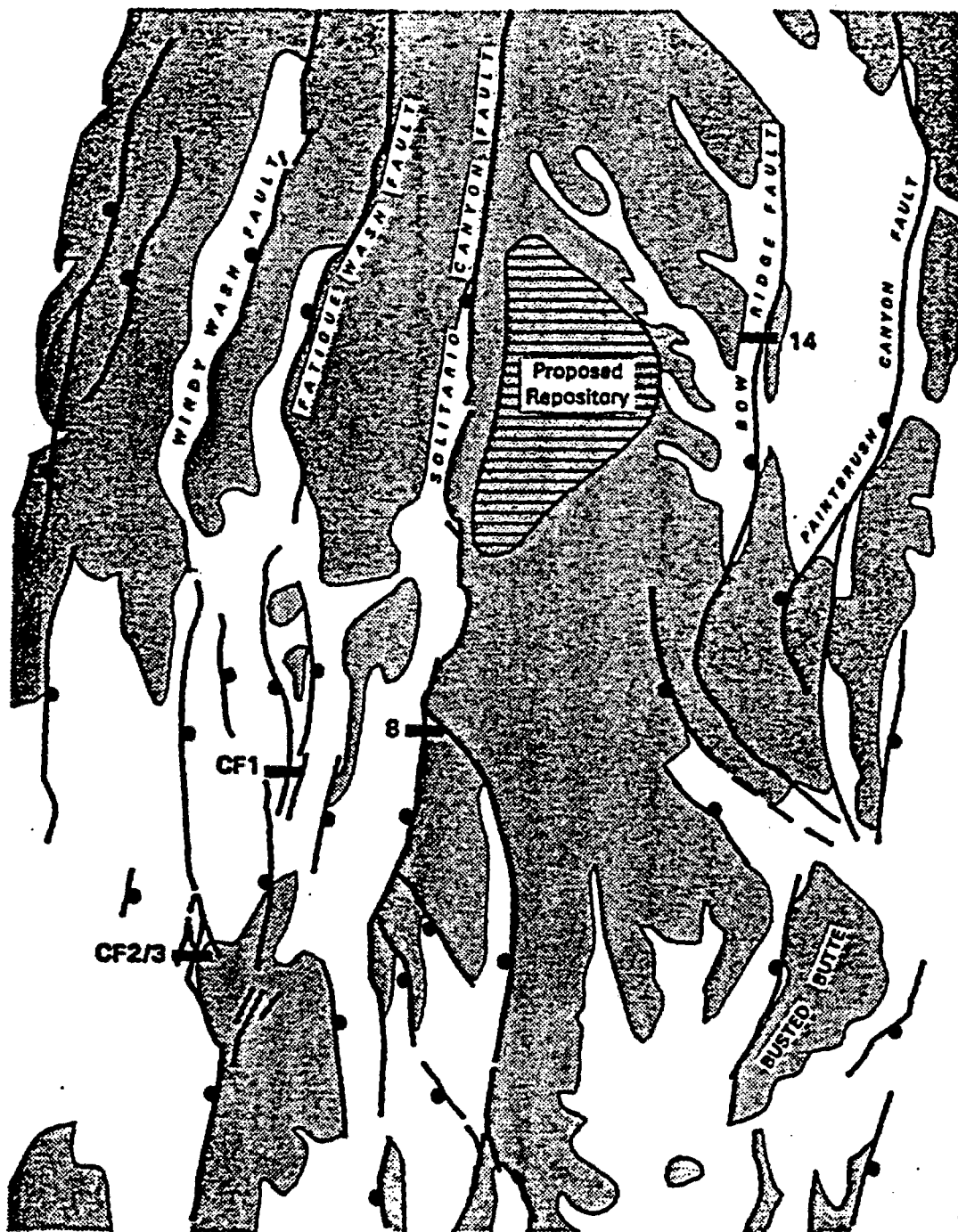
- State of Nevada's Regulatory Role
- 10 CFR 100, Appendix A
- 10 CFR 960 and DOE Order 6430.1A
- Site Characterization Plan
- Near Field Faults
- Seismic Hazard Action Plan



FAULTS WITH YOUNG SCARPS



TRENCHES EXPOSING BASALTIC ASH IN FAULTS



● Technical Assessment: ESF Seismic Design	Dec 1992
● Topical Report: Seismic Hazard Methodology	Apr 1993
● Final Quaternary Fault Map of the Yucca Mountain Area	Apr 1993
● Quaternary Faulting in Midway Valley	Nov 1993
● Update on Site Suitability: Seismic Hazard Considerations	May 1994
● Seismic Vulnerability of a Potential Underground Repository at Yucca Mountain	Jun 1994
● Effects of Local Site Geology on Seismic Ground Motion	Sep 1994
● Preliminary Deterministic Seismic Hazards Assessment of Yucca Mountain	Dec 1994
● Final Determination of Ground Motion from Controlling Seismic Events	Sep 1995
● Probabilistic Seismic Hazard Analysis of Yucca Mountain	Dec 1995
● Topical Report: Seismic Hazard and Seismic Design Basis for Yucca Mountain	Jun 1996

TABLE 3-1
Studies Related to Seismic Hazard Assessment

Tectonic Data Collection	
8.3.1.17.4.2	Midway Valley - Surface Facility
8.3.1.17.4.3	Quaternary Faulting Within 100 km of Yucca Mountain
8.3.1.17.4.4	Quaternary Faulting within NE-Trending Fault Zones
8.3.1.17.4.5	Detachment Faults
8.3.1.17.4.6	Faulting at the Site
8.3.1.17.4.7	Subsurface Geometry of Faults
8.3.1.17.4.8	Stress Fields within the Site
8.3.1.17.4.9	Tectonic Geomorphology
8.3.1.17.4.10	Geodetic Leveling
8.3.1.17.4.11	Regional Lateral Crustal Movement
Seismic Hazards Interpretation and Modeling	
8.3.1.17.3.1.1	Identify Relevant Earthquake Sources
8.3.1.17.3.1.2	Deterministic Seismic Hazard Analyses
8.3.1.17.3.3	Ground Motion from Regional Earthquakes
8.3.1.17.3.4	Site Effects on Ground Motion
8.3.1.17.3.5	Ground Motion from Controlling Events
8.3.1.17.3.6	Probabilistic Seismic Hazard
8.3.1.17.3.12	Tectonic Model and Synthesis
Critical Geologic Supporting Studies	
8.3.1.4.2.1.2	Surface-Based Geophysics
8.3.1.4.2.2.1	Geologic Mapping North and West of Yucca Mountain
8.3.1.4.2.2.2	Surface Fracture Studies
8.3.1.4.2.2.3	Borehole Evaluation of Faults
8.3.1.8.5.2.3	Heat Flow at Yucca Mountain
8.3.1.8.3.2.5	Effects of Faulting on Water Table Elevation
8.3.1.5.1.4.2	Surficial Deposits Map of Yucca Mountain
Operation of Seismic Monitoring Network	
8.3.1.17.4.1	Historical and Current Seismicity