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April 5, 2013

Subject: Esmeralda County, NV Review and Comment on the December 2012 Nevada Commission on Nuclear Projects Report and Recommendations

To: Senator Donald Gustavson
Assemblyman Ira Hansen

Esmeralda County, NV is geographically located between North and South Nye County, NV and is recognized as an Affected Unit of Local Government in accordance with the Nuclear Waste Policy Act of 1982.

Esmeralda County government officials have always placed safety and health as the top priority for our citizens when considering the Yucca Mountain Project. The Esmeralda County Commissioners passed Resolution No. 11-R-5 in April 2011 declaring the Yucca Mountain licensing proceedings should continue and the NRC should complete a thorough and detailed review of the License Application in accordance with the Nuclear Waste Policy Act of 1982. If that was completed and the license to construct was issued, Nevada County's consent to host the proposed repository at Yucca Mountain should be accepted by the Department of Energy. Understanding that many changes economically have taken place in the State of Nevada since 1987, we are suggesting that negotiations should be re-introduced between the U. S. Government, Nye County, the State of Nevada and the other Affected Units of Local Government starting immediately after the licensing proceedings are re-started.

In early January 2013, the Nevada Commission on Nuclear Projects forwarded its biennial report to the Governor and Nevada Legislature summarizing their perspectives on the status and future of the Yucca Mountain project and its recommendations. Our review of the report leads us to conclude that the report lacks balance by failing to present a truly comprehensive assessment of the situation and denies the Governor and Legislature information essential to a more complete understanding of the legal, technical, and political issues on which informed decisions should be made. **Of specific note are statements regarding the technical adequacy of the Yucca Mountain site and what the report calls the "money myth."**

It is important to recognize that the Nuclear Waste Policy Act (NWPA) remains the law of the land. Through the processes created in that law, the Secretary of Energy recommended Yucca Mountain to the President as the site for the nation's first high-level radioactive waste repository. Congress overrode Nevada's veto of the

President's recommendation and, with the passage of H.J.R. 87; Congress formally approved the site at Yucca Mountain for the development of a repository. **Political, not technical, reasons led DOE to file a request to withdraw the Yucca Mountain license application; NRC's licensing board would not allow this, and the Commission itself was not able to overturn that finding.** Today, the future of the Yucca Mountain project (ultimately in the hands of Congress) is currently in the hands of the United States Court of Appeals for the District of Columbia which must decide if DOE's withdrawal of the Yucca Mountain application without safety justification violated the NWPA . Based upon the Court's previous orders, there is a very real chance that the court case challenging the administration's efforts to withdraw the license application and terminate the Yucca Mountain program may force the Administration to restart the licensing process.

The Commission's report draws heavily on a recent article by Dr. Michael Thorne that makes much of its author's perceived technical weaknesses of the Yucca Mountain site. Esmeralda County remains convinced that the appropriate course of action is to restart the licensing hearings and let the Nuclear Regulatory Commission experts do what they were directed to do in the Nuclear Waste Policy Act -- judge the technical adequacy of the Yucca Mountain site. Even though DOE attempted to withdraw its license application, DOE explicitly stated that its withdrawal was not based upon technical flaws in the application or upon findings that Yucca Mountain was unsafe. Attached to this letter is a short paper (Atch 1) providing a rebuttal to the technical arguments cited in the Commission's report. Should you desire more detailed technical briefings, the Esmeralda County Repository Oversight Program Office staff can be made available for briefings or to review with you the extensive documentation that supports the positions in the attached paper (Atch 1).

Among the recommendations of the Blue Ribbon Commission (BRC) on America's Nuclear Future are two recommendations of significant interest to Nevada. It is obvious that a repository at Yucca Mountain best responds to the BRC's recommendation for ***prompt efforts to develop one or more geologic disposal facilities***, as it is highly unlikely that a different repository site could be found, characterized and licensed in any sense of the word *promptly*. It is the second recommendation, however, of which the Legislature should be particularly aware: ***a new consent-based approach to siting future nuclear waste management facilities that would include ...a flexible and substantial incentive program.*** Should Congress act on this recommendation, it flies in the face of what the report calls the "money myth." When the President and the Secretary of Energy asked the Blue Ribbon Commission what was needed to make a repository program successful, they replied "incentives." Legislation being prepared in Congress is responsive to this recommendation; **Esmeralda County respectfully suggests that Nevada needs to act to investigate just how willing the Federal government is to providing substantial incentives to consenting state and local governments**

No one wants Nevada to accept a disposal facility that isn't safe. Conversely, if it can be shown to be safe through the NRC licensing proceedings, then it is wrong not to seek to determine what benefits could accrue to the State. The second attachment is a brief White Paper outlining the types of benefits that Nevada should seek for compensation for hosting a safe repository. These incentives and benefits would supplement those already provided to the State and local government host for the repository already in the NWPA. **It is imperative that elected officials representing the interests of Nevada's citizens have a more complete understanding of all the relevant issues so that they know and understand what their position, for or against Yucca Mountain, means to all of us.** As our Senator and Assemblyman we ask that you share this information with your respective legislative colleagues.

We offer and welcome the opportunity to meet and address any questions you or your legislative colleagues might have on these issues. Our primary point of contact is Mr. Edwin Mueller, phone: (702) 810-8988, email: muellered@msn.com

Sincerely,



Nancy Boland, Chair
Esmeralda County Board of County Commissioners

Attachments:

1. Recent Technical Issues Raised by the State of Nevada to be Addressed Should the Yucca Mountain License Application Process be Restarted
2. A Role for Nevada in Safety, Equity, and Benefits in Yucca Mountain Related Issues

CC: Governor Sandoval
Nevada Commission on Nuclear Projects
Nevada's Congressional Delegation
AULG County Commissions
Esmeralda County Commissioners

ATTACHMENT 1

RECENT TECHNICAL ISSUES RAISED BY THE STATE OF NEVADA TO BE ADDRESSED SHOULD THE YUCCA MOUNTAIN LICENSE APPLICATION PROCESS BE RESTARTED

Michael D. Voegele* and Darrell Lacy**

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A recent State of Nevada sponsored paper presents once again the State's views about the adequacy of the Yucca Mountain site. While the paper characterizes the Yucca Mountain license application as grossly inadequate, all evidence points otherwise. The expected content of the post closure Safety Evaluation Report required for the licensing hearing is reflected in the Technical Evaluation Report published by the Nuclear Regulatory Commission staff, which strongly supports a conclusion that the staff accepted the safety arguments and was prepared to recommend that the next steps be taken in the licensing hearings. Technical issues presented in the State's paper include: arguments that the geological environment alone should provide long-term protection and limit the transport of radionuclides to the human environment in the event of container failure, the integrity of the waste packages, the use of the unsaturated zone for development of a repository, the role of drip shields at Yucca Mountain, and the Safety Case for a repository at Yucca Mountain. Each of the State's technical points raised is examined in the paper and evidence to support the position that the data and information used to prepare the Yucca Mountain repository license application is in fact sound is presented.

I. INTRODUCTION

The action of the United States Court of Appeals for the District of Columbia Circuit to hold temporarily in abeyance the decision on the petition for writ of mandamus to force the restart of the Yucca Mountain license application review can be interpreted as a decision to grant the petition unless Congress enacts statutory text that makes clear that the Nuclear Regulatory Commission may not use any appropriated money, including previously appropriated funds, for the Yucca Mountain licensing process. That direction from Congress did not occur. At this time, the Court's decision has not yet been issued. If it is issued, strong support² for resuming the Yucca Mountain licensing process in the House of Representatives, could result in a resumption of the license application review.

A recent paper³ presents a synopsis of the State of Nevada's perspectives about the adequacy of the Yucca Mountain site. Thorne's premise is that, to date, some \$9 billion has been expended investigating the Yucca Mountain site and in developing what he characterizes as a grossly inadequate license application that the U.S. administration is seeking to withdraw.

It is clear that the U.S. Administration actions seeking to withdraw the license application were politically motivated, and did not have a technical basis. The actions began with campaign commitments made in Nevada preceding the 2008 presidential election that were implemented by the president after he took office. Secretary of Energy Chu initially testified to Congress that the Yucca Mountain site was unsuitable, and later, after challenge, that the Yucca Mountain site was unworkable. In response to a challenge by Congress to provide technical evidence that the site was in fact unsuitable, the Secretary was unable to do so.⁴ It would seem that if the state of Nevada, supporting the Department of Energy's effort to withdraw the license application, had technical information that would have substantiated arguments of the supposed inadequacy of the license application it should have been brought forward at that time and given to Congress. Nye County, which used funds granted under the Nuclear Waste Policy Act to perform independent scientific investigations, and which had not concluded that the site was unsuitable or unworkable, not only made its information publically available, the Department of Energy used it in preparing the license application. There is no basis to support a conclusion that the Yucca Mountain license application is grossly inadequate; conversely, all evidence points otherwise. In August 2008, Dr. Stephen Chu, then Director of the Lawrence Berkeley National Laboratory, and the Directors of the nine other National Laboratories jointly called for "licensing of the Yucca Mountain Repository as a long-term resource."⁵ These are the top managers of the National Laboratories by which many of the principal scientists responsible for characterizing the Yucca Mountain site were employed. It is difficult to imagine that those Laboratory Directors would sign such a letter if they, or scientists in their employ, had

significant technical concerns about the licensing of the Yucca Mountain site. The Yucca Mountain license Application was submitted to the Nuclear Regulatory Commission on June 3, 2008⁶ and docketed for review by the Nuclear Regulatory Commission staff on September 8, 2008.⁷ The review for docketing was the opportunity for the Nuclear Regulatory Commission staff to decide if the Department of Energy license application was appropriate for formal review. As the docketing action began the three year period allowed by the Nuclear Waste Policy Acts to complete the license application review, the staff certainly would not have docketed the license application were it “grossly inadequate.”

II. BACKGROUND

It was during formal license application review process that Secretary Chu began to argue that the Yucca Mountain site was unworkable and the project would be dismantled; the Blue Ribbon Commission on America’s Nuclear Future¹⁰ was empanelled to find alternate solutions to the waste disposal problem. Because the three year time for completing the license application review was well underway, the Nuclear Regulatory Commission staff continued to work to prepare its Safety Evaluation Report. By September 30, 2011, and at the direction of the Commission, the Nuclear Regulatory Commission staff had closed out its technical review of the Yucca Mountain license application, and the Atomic Safety and Licensing Board had suspended its adjudicatory hearing on the application.¹¹ Because of these actions, the Nuclear Regulatory Commission staff was prevented from issuing the Safety Evaluation report to document their review of Volume III of the Safety Analysis Report, which deals with the post closure health and safety of people who might live in the vicinity of Yucca Mountain. Nonetheless, the expected content of the post closure Safety Evaluation Report is reflected in the Technical Evaluation Report¹², published by the Nuclear Regulatory Commission staff. The staff noted that the Technical Evaluation Report was developed using the regulations at 10 CFR Part 63 and guidance in the Yucca Mountain Review Plan, with the caveat that the Technical Evaluation Report did not include conclusions as to whether or not the license application satisfied the Commission’s regulations. The staff noted that the Department of Energy submitted information consistent with the guidance and noted that the repository (i) is composed of multiple barriers; (ii) the total system performance assessments used for the individual protection, human intrusion, and separate groundwater protection calculations are reasonable; and the technical approach and results of the total system performance assessments are reasonable. The staff’s confirmatory calculation results showed that the average annual dose curve was consistent with the model abstractions, probabilities, and treatment of uncertainties, each of which were reviewed separately using the guidance in the Yucca Mountain Review Plan. The most reasonable conclusion that can be drawn from the staff’s Technical Evaluation Report is that the staff was prepared to recommend that the next steps be taken and proceed to the licensing hearings. Here too, this is hardly an indication that the license application was “grossly inadequate.” A similar conclusion can be drawn from a report¹³ prepared by the majority staff of the House Committee on Science, Space, and Technology, based on their review of an unredacted copy of the draft Safety Evaluation Report. The report notes that Volume III of the Safety Evaluation Report was obtained by the Committee only after repeated demands and over the objections of the Nuclear Regulatory Commission Chairman. The Committee described the results of their review as striking; despite numerous suggestions by political officials, including President Obama, that Yucca Mountain was unsafe for storing nuclear waste, the Committee could not identify a single document to support such a claim. To the contrary, the Committee found great agreement among scientific and technical experts that waste can be safely stored at the site in accordance with Nuclear Regulatory Commission requirements. The Committee found that Safety Evaluation Report Volume III demonstrates in excruciating detail the level of technical support in favor of the site’s advancement: the Committee found that the staff agreed with over 98.5 percent of the Department of Energy’s findings regarding the site’s ability to meet regulatory requirements, and that the remaining 1.5 percent did not impact the staff’s overall conclusions. These conclusions found that the License Application complied with applicable Nuclear Regulatory Commission safety requirements, including those related to human health and groundwater protection, and the specific performance objectives called for in Nuclear Regulatory Commission regulations for disposal of high-level radioactive wastes at Yucca Mountain (10 CFR 63.113-115).¹⁴

Thorne's perspective on the Blue Ribbon Commission report is that the existing waste management programs in the United States have been troubled for decades and are now almost entirely broken down. That premise is inconsistent with statements¹⁵ in the report, (“*We recognize that current law establishes Yucca Mountain in Nevada as the site for the first U.S. repository for spent fuel and high-level waste, provided the license application submitted by DOE meets relevant requirements*” added subsequent to the draft version of the

report. While the report acknowledged that it was directed not to provide siting recommendations, it clearly did not dismiss the Yucca Mountain repository from continued consideration. Thorne's technical points address: arguments that the geological environment alone should provide long-term protection and limit the transport of radionuclides to the human environment in the event of container failure; the integrity of the waste packages; the use of the unsaturated zone for development of a repository; the role of drip shields at Yucca Mountain; and the Safety Case for a repository at Yucca Mountain. These points are presented in the context of assumptions that do not recognize that in order to implement the recommendations of the Blue Ribbon Commission, significant changes to the Nuclear Waste Policy Act would be needed. Each of the technical points raised by Thorne is examined in the paper and evidence to support the position that the data and information used to prepare the Yucca Mountain repository license application is in fact sound is presented. He questions why an unsaturated environment should be preferred over other geological contexts that exist in the U.S., and that are more akin to those being studied and developed in other countries. Such criticism of the Yucca Mountain project is likely tied to a lack of appreciation for the intent of the Nuclear Regulatory Commission regulations, whether 10 CFR part 6314 which was developed specifically for the Yucca Mountain site, or 10 CFR part 6016 the generic standard.

III. The Role of the Geological Environment

Much of Thorne's paper is devoted to his assessment of the technical adequacy of the Yucca Mountain site. The argument starts with a premise, notably, *"Worldwide, there is broad agreement that deep geological disposal is the preferred option for spent fuel and high-level waste disposal, with the intent being that the geological environment will provide long-term protection of the waste packages from degradation, and will limit the transport of radionuclides to the human environment in the event of container failure."* The second part of that premise is, however, inconsistent with U.S. policy as expressed in the Nuclear Waste Policy Act and Nuclear Regulatory Commission regulations. In fact, when raised in the United States Court of Appeals for the District Of Columbia Circuit by the state of Nevada at the time of the site recommendation lawsuits,¹⁷ it was found to not have merit. Recommended international standards¹⁸ for disposal of radioactive waste do not argue for reliance on a single barrier. Rather, they note that migration of radionuclides to the accessible biosphere, dispersion of radionuclides into the accessible biosphere and the consequent exposure of people may occur as a consequence of the slow degradation of engineered components and the slow transport of radionuclides from the facility by natural processes.

Furthermore, Thorne contradicts his own premise by noting that, for example, in Sweden and Finland, their proposal is to dispose of spent fuel in copper canisters in a geological environment in which significant degradation of the packages would not be expected on a time scale of 1 million years or longer. In other words, total reliance on the engineered barrier system and not the geological system. While the thrust of his arguments are against disposal in a unsaturated zone site, his conclusion that a typically suitable repository environment for disposal displays properties such as long-term (millions of years) geological stability and low groundwater content and flow at repository depths is not an argument against an unsaturated zone disposal site.

It is interesting that the argument for long-term stability of a geologic repository uses Sweden as an example. Mörner¹⁹ has noted that while the Fennoscandian Shield has been claimed to offer exceptionally stable bedrock conditions over immense time periods, the last deglacial phase, some 10,000 years ago, had a totally different situation from that of today. He notes that at that time, Sweden (Fennoscandia) was a high seismic area, due to exceptionally high rates of uplift, was characterized by exceptionally high seismic activity in both amplitude and frequency, and that those conditions will be repeated in future Ice Ages. He regards this "super seismicity" as a characteristic phenomenon of deglaciation deformation and probably glaciation deformation as well. He concludes that in such an environment the Fennoscandian bedrock cannot offer any safe repository for periods entering into and passing through a future Ice. In the absence of true long-term safety for a repository in bedrock he recommends utilization of a dry rock deposit method. The dry rock deposit method refers to an artificially drained bedrock repository, where the waste is placed under constant control, and where it remains accessible, stored in the bedrock under dry conditions, under constant control and monitoring, accessible for maintenance and possible future methods of rendering the waste harmless and even removal. What is most interesting about this concept is that the solution is to create, artificially in the Swedish bedrock, that which exists naturally at Yucca Mountain.

IV. The Integrity of the Waste Packages

Thorne refers the State of Nevada contentions²⁰ to conclude that it has been demonstrated experimentally that the waste package materials could not maintain their physical integrity in the environment that would be present in a repository at Yucca Mountain where infiltrating water would be rendered corrosively aggressive to the waste containers by water-rock reactions. The argument is that exposure conditions will involve water dripping onto the canister where it will be evaporated under the influence of the elevated temperature leading to significantly more aggressive conditions, and hence worse performance, than that predicted by the Department of Energy. Intuitively, this argument is problematic, as it requires mechanisms and conditions that lead to concentration of the chemical constituents of the pore water. Such conditions, which require pressurized boiling of the infiltrating pore water, do not exist at Yucca Mountain; if, in fact the system were able to withstand a pressurized boiling mechanism, it is not likely that water would even infiltrate.

The Department of Energy investigated processes and characteristics of the waste package that are important to the capability of the engineered barrier system.²¹ General corrosion rates of Alloy 22 in a range of likely environmental conditions were found to be sufficiently low that the waste packages will last for long periods of time and are so modeled within the total system performance assessment. Localized corrosion mechanisms on the waste package surface are dependent on the thermal-hydrologic and thermal-chemical environment on the waste package surface. Localized corrosion is only possible in those cases where the drip shield fails to perform its function, incoming seepage is allowed to contact the waste package and certain aggressive environments are present. This may occur due to drip shield early failure or after considerable drip shield thinning due to general corrosion. Localized corrosion due to dust deliquescence is excluded from total system performance assessment. Stress corrosion cracking of Alloy 22 is modeled to occur as a result of mechanical degradation following seismic events and in the closure weld lid region for the nominal scenario. Such stress cracks are sufficiently small and tight to allow only diffusive transport of radionuclides through the cracks. A range of human factor errors could result in a waste package being emplaced that has the potential for an early failure at a weld. This possibility was included in abstraction models used in the early failure scenario class of the total system performance assessment.

The Nuclear Regulatory Commission staff found the Department of Energy conclusions to be reasonable.¹² In recommending against allowing this contention to be admitted to the licensing hearing, the Nuclear Regulatory Commission staff pointed out that the contention was not supported by a minimally sufficient or reasonably specific factual or legal basis for the petitioner's allegations that indicates the alleged corrosion processes would significantly degrade waste package performance, nor was it supported by expert opinion.⁹

V. Disposal in the Unsaturated Zone

Thorne observes that the fundamental problem with the Yucca Mountain facility is its position above the water table, where he believes infiltrating water would be rendered corrosive and aggressive to the waste containers by the water rock reaction that would occur at the high temperatures projected in the vicinity of the repository. This neglects the obvious facts that when temperatures are high, water in pore spaces in the vicinity of the repository would be driven away from the facility by thermal gradients, and infiltrating water would be diverted away from the facility by the capillary forces created as the rock dried out. Further, if the rock is as freely draining as Thorne assumes, the water would not sit above the repository as the wastes cool. Incidentally, the full-scale heater tests conducted in the Exploratory Studies Facility showed that water did not pond above the experiment room.²² Rather, the water drained to the side of the heated rock zone, an attribute that is relied on in the Yucca Mountain repository safety assessments and implemented in the design by limiting mid-pillar temperatures to allow drainage of liquid water.

Because no other countries propose to locate a repository above the water table, Thorne observes that the issues that face the Yucca Mountain project are not being addressed by research and development activities elsewhere in the world. This does not make them technically incorrect or weak. The U.S. approach to looking at potential repository sites in the unsaturated zone began with U.S. Geological Survey suggestions that disposal in the unsaturated zone would offer advantages in deep geologic disposal of high-activity waste, the thought being that a site with limited water flux downward would be a benefit to repository performance. Thick unsaturated zones in the southwest U.S. were identified as possible areas for disposal using shallow boreholes, deep backfilled trenches, or tunnels.²³ An important factor though to be favorable to such disposal was the probable absence of an effective mechanism to dissolve and transport the radionuclides to the deep water table. While the focus²⁴ of was on disposal in the unsaturated zone in remnant craters from nuclear weapons tests, it identified a number of natural unsaturated zone natural barriers to radionuclide movement.

Geologic disposal of high-level nuclear waste in repositories above the water table in arid regions was addressed.²⁵ U. S. Geological Survey scientists identified multiple natural barriers in the unsaturated zone, including low flux, high transmissivities, the presence of zeolite minerals, and air circulation through the unsaturated zone. Advective transport by water was, and still is, considered the most serious threat to mobilizing nuclear waste. The deep water table and thick unsaturated zone at Yucca Mountain were thought to be indications of a very low infiltration rate and therefore a negligible downward flux. Whether or not the Department of Energy ended up taking credit for all of the identified unsaturated zone natural barriers in the license application, the fact remains that the regulations allow the applicant to determine those barriers upon which reliance for performance is based; there is no requirement placed on any single barrier.¹⁴

There is a clear history of the U.S. deliberately pursuing unsaturated zone disposal and support for doing so. The Nuclear Regulatory Commission specifically amended its disposal regulation to allow disposal in the unsaturated zone;²⁶ this was a clear acknowledgement that the regulator of repository development in the U.S. found the technology acceptable. A Viability Assessment²⁷ prepared at the direction of Congress, made clear the Department's intent to develop a repository in the unsaturated zone. Congress directed the preparation of this report in the 1997 Appropriations Act to provide Congress, the Secretary of Energy, and the public, information on the progress of the Yucca Mountain Site Characterization Project, and to identify critical issues to be addressed before an informed decision could be made by the Secretary on whether to recommend the Yucca Mountain site for a repository. Included in the Viability Assessment was an explanation of why the United States was considering a repository at Yucca Mountain, and a recommendation that the work should proceed. Three federal agencies with interest in the repository program reviewed and responded to the Viability Assessment. Review of the Viability Assessment presented an opportunity for each of these agencies to inform Congress of concerns with developing a repository in the unsaturated zone. While noting that considerable work remained to be done prior to site recommendation, all three were supportive of continuing development of the Yucca Mountain site in the unsaturated zone.

The U. S. Geological Survey prepared a report ²⁸ for the Director of the Agency, noting that it agreed with the Department of Energy's general conclusion that the Yucca Mountain site remained promising for development as a geologic repository. The Survey report is positive in highlighting the advantages of the unsaturated zone for repository development. The Nuclear Waste Technical Review Board described the Viability Assessment as the most significant milestone to that date in the characterization and evaluation of the Yucca Mountain site.²⁹ The Board concluded that Yucca Mountain continued to merit study as the candidate site for a permanent geologic repository and that work should proceed to support a decision on whether to recommend the site to the President for repository development. The Nuclear Regulatory Commission also reviewed the Viability Assessment.³⁰ Not only did the Nuclear Regulatory Commission not object to development of a repository in the unsaturated zone, it agreed with the Department of Energy's proposal to proceed with site characterization at Yucca Mountain, calling for further exploration and technical evaluation to determine the acceptability of the Yucca Mountain site.

The U.S. Nuclear Waste Technical Review Board³¹ was unequivocal in their endorsement of the unsaturated zone as a suitable medium for geologic disposal. They noted: "*(c)onsiderable methodology and evidence have been developed to indicate the technical feasibility of isolating nuclear waste in an unsaturated zone of the subsurface that involves an oxidizing environment, thus expanding the options for siting a repository.*" They further noted that the "*Yucca Mountain program has contributed significantly to the technical knowledge base for developing a geologic disposal facility for high-activity waste,*" that "... *major advances were made in assessing the performance of engineered barriers and the natural system associated with geologic disposal,*" and that "*(a)dvances were made in modeling water flow in unsaturated fractured rock in semiarid zones, understanding the role of matrix diffusion in transporting radionuclides, and using analog information as evidence for assessing hydrogeologic behavior of geologic units.*" They concluded that the "*Yucca Mountain program developed considerable data, methodology, and evidence to indicate the technical feasibility of isolating high-activity waste in an unsaturated, oxidizing environment.*"

VII. The Role of Drip Shields at Yucca Mountain

Thorne presents a conclusion that the safety analysis conducted by the Department of Energy has shown that without the additional protection of the titanium drip shields, disposal of the waste package in the proposed repository design for Yucca Mountain would give rise to radiation doses to members of the local population far in excess of the federal standard for Yucca Mountain repository. This conclusion appears to be derived from a

Department of Energy analysis using probabilistic results supporting the license application that was applied inappropriately.²⁰

Specifically, releases in the Yucca Mountain safety assessment depend upon an assumption of infiltrating water contacting the most susceptible waste package and forcing that package failure to immediately release radionuclide content. What Nevada did in developing the Critical Role of Drip Shield contention was take the probabilistic aspects of this early drip shield failure problem and treat them as a worst case deterministic problem. The license application calculation hinges on an assumed number of fast paths; the probability of a fast pathway intersecting each waste package is very low. The probability of each waste package being the worst case for release (it is actually the high-level radioactive waste packages that lead to the worst case releases for early failure) is also low. Rather than treating the problem as a conditional probability, the calculation supporting the contention appears to have simply multiplied the number of waste packages by the release from a single failed waste package to arrive at the number to which Thorne is referring here.

Thorne next turns to the issue of drip shield installation and presents the state of Nevada argument that it is unlikely that a comprehensive installation of the drip shields could be achieved even if the political will to undertake that installation could be relied upon. Thorne argues that it is surely not acceptable to base public safety of such a technically risky and politically uncertain proposition. This is an example of turning a technical issue into a sociopolitical issue. The "no drip shield installation" scenario assumes the lack of will or ability of the government to meet its commitments. If the same assumption were made in a scenario where the wastes were left on the sites where they exist today, the result would not be small amounts of potential contamination to a remote ground water source in Nye County; it would be large scale contamination of the water sources near the locations of the current fleet of nuclear reactors. Such a scenario was considered in the Yucca Mountain Final Environmental Impact Statement²² and ridiculed by Nevada as being unrealistic. Installation of the drip shields will be a condition of the license should the Nuclear Regulatory Commission find that they are important to waste isolation.

VIII. The Safety Case for a Repository at Yucca Mountain.

Thorne's principal conclusion begins with the statement that the problems in developing a safety case for Yucca Mountain have arisen essentially from selection of an inappropriate site and an invalid disposal concept.

Thorne's argument that the large quantities of water that are in the unsaturated rock at Yucca Mountain can percolate rapidly downward to the saturated zone is totally inconsistent with the scientific evidence developed for the Yucca Mountain license application. His argument that the downward seeping water would enter the hot oxidizing environment of the waste tunnels and there promote rapid waste package corrosion, waste dissolution, and the migration of radionuclides to a major aquifer to an unacceptable degree is not proven by any scientific basis known to have presented by the state of Nevada. It is predicated on assumptions, such as those found in the state of Nevada's contentions, which have not received technical peer acceptance as having technical merit; that lack of acceptance is due in large part to the state of Nevada not presenting credible technical analyses and publications to support their arguments.

While it is true that no other country is considering a repository with temperatures as high as those proposed for Yucca mountain, Thorne's argument neglects the facts of the higher relative amounts of wastes to be disposed at the U.S. repository site, the lack of a U.S. commitment to reprocessing, and the fact that the U.S. policy to date has consistently avoided a long-term interim storage program. Those three conditions are so different from those being faced by any other country that it is inappropriate to try to compare the disposal approaches developed in the U.S. to those developed elsewhere. Thorne makes much of an International Atomic Energy Agency position on multi-barrier systems, but completely ignores the existing regulations in the United States. The U.S. regulations do not require complete reliance on the natural barrier system, nor do they specify what relative amounts of reliance should be placed on individual barriers, nor do they require a strict defense in depth argument. Rather, the risk-informed, probability-based nature of the regulations of the U.S., which differ significantly from anything proposed anywhere else in the world, allow the applicant to demonstrate technically how the site will perform, including an analysis of the uncertainties associated with that calculation. Thorne's argument that the scientific and technical basis of the technical calculations supporting the Department of Energy license application are in question is of course correct; that is the purpose of the licensing hearing to be held following completion of the Safety Evaluation Report by the Nuclear Regulatory Commission staff.

The argument that three independent panels of Nuclear Regulatory Commission administrative hearing judges accepted over 300 potential safety, environmental, and legal the contentions from intervening parties that raised

issues is specious at best, given that the Nuclear Regulatory Commission staff did not recognize sufficient technical merit in the majority of these contentions and had recommended against their adoption. In describing the implementation of the Blue Ribbon Commission's recommendations, Thorne argues that under the recommendations the host state and affected tribal and local governments would all have had to agree to the terms of the site study and what was to be built prior to the submission of a license application. When the studies were complete, a license application would be prepared, and he interprets the recommendations as the host state and affected tribal local government should be given the opportunity to sign off on it before submittal. While that may be an appropriate interpretation of the Blue Ribbon Commission recommendations, it is completely inconsistent with the policy developed in the Nuclear Waste Policy Act. Examination of the history of the development of the Act indicates that Congress was quite sensitive to the issue of state vetoes, and addressed it by allowing the state to submit a notice of disapproval, at the time the site recommendation, which would then have to be overridden by both houses of Congress. A more appropriate interpretation of the Nuclear Waste Policy Act is that while the state and affected unit of local government would be given an opportunity to participate in a licensing hearing, neither would be given full veto authority.

IX. CONCLUSIONS

The selection of the Yucca Mountain site for characterization and the decision to pursue development in the unsaturated zone were deliberate choices. The Yucca Mountain designation process followed the applicable laws and regulations. Congress assigned responsibilities to federal agencies to promulgate standards and develop requirements and criteria to be used in approving or disapproving applications to construct and operate repositories. These agencies provided independent technical oversight of the work to characterize and license the Yucca Mountain site. Congress created a new independent Agency, with members nominated by the National Academy of Sciences, to evaluate the validity of activities undertaken by the Secretary and report to Congress and the Secretary its findings, conclusions, and recommendations. When Congress questioned the state of the program and requested a Viability Assessment, no reviewable technical information demonstrating the unsuitability of the site was brought forward. Alternatively, knowledgeable Agencies such as the U. S. Geological Survey, the Nuclear Regulatory Commission, and the Nuclear Waste Technical Review Board all recommended going forward with the site.

Congress afforded the State of Nevada an opportunity to submit a notice of disapproval at the time of recommendation of the site by the president. While Nevada submitted the notice of disapproval, the lack of technical rationale supporting the State's position that the site was unsuitable ultimately resulted in the overturning of the notice by both Houses of Congress. Subsequently, Nevada failed to prevail on their technical arguments in Court. Multiple documents were made available to the public and technical communities while the site recommendation process was underway.^{32,33,34} The Department of Energy actively sought technical feedback on the content of these documents; no demonstration of the unsuitability of the site was provided. Finally, the license application contention identification process provided an opportunity for submission of technical information demonstrating the unsuitability of the Yucca Mountain site. While the Nuclear Regulatory Commission staff generally found that the State of Nevada's technical arguments were not compelling,⁹ the Licensing Board elected to admit the contentions because they met the proper legal test for contentions. The technical merits of the contentions have not been addressed to this point. That was to be the next phase of licensing, where and the State of Nevada would have an opportunity to present any technical information it may have to substantiate their arguments should the licensing hearings resume.

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ATTACHMENT 2

A Role for Nevada in Safety, Equity, and Benefits in Yucca Mountain Related Issues

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In order to get to a consent based arrangement for siting a nuclear waste repository, the Blue Ribbon Commission stated the necessity of (1) assurances from the Federal government of an enduring and significant role for State and Local government in the project to assure safety, and (2) a significant federal incentive package for the State and Local governments. The Nuclear Waste Policy Act process that designated Yucca Mountain succeeded over the objections of the State of Nevada because of carefully negotiated provisions that were designed to give the state an opportunity to object, but not an outright veto. All ongoing efforts related to high level radioactive waste disposal recognize that the Nuclear Waste Policy Act is still in force, and unless it is changed, Yucca Mountain remains the only designated repository site. In other words Yucca Mountain has not gone away. A Court decision or an action by Congress could bring the program back to the forefront in Nevada. Now is the time to investigate exactly what benefits could accrue to Nevada. If a repository at Yucca Mountain can be constructed and operated safely, it is imperative that Nevada not be caught unprepared and in a catch-up position. If the Department of Energy (DOE) secures a license to construct without Nevada involved in the process, DOE will make whatever politically expedient, path of least resistance decisions it needs to advance its decisions.

The opportunities for meaningful negotiations on issues associated with implementation of the Yucca Mountain Project have not and will not occur without a triggering event. The triggering event could be a Nevada initiative to address its current fiscal circumstances, an overture by Congress offering an opportunity to pursue benefits associated with accepting the repository, or a reaction to a court decision beyond Nevada's control to proceed with developing the repository. A window of opportunity for Nevada to negotiate from a position of strength still exists; with time, the negotiating strength now held by Nevada will decline. Nevada's political leadership must have the will to deal constructively with repository issues, and take advantage of an opportunity that allows them to retain their personal, professional, and political credibility as elected representatives.

If the negotiations can be triggered, their goal would be to obtain legally-binding agreements between the federal government and the Nevada jurisdictions. The basis of those consent agreements must include:

- 1. *An intervention process*** that includes a substantive State role in providing oversight and advice for any storage facility/repository, including at least limited influence in the Nuclear Regulatory Commission's exercise of its "stop work" authority by means of the oversight and the quality assurance programs.

2. ***A monitoring process:*** By means of State Universities' role that would focus on public health and environmental monitoring activities designed to provide long-term protection for the site community, the site State, and potentially affected residents.

3. ***A benefits/impact assistance process*** which would include virtually everything else necessary for a consent based program: direct payments, program related activities and program spin-offs, land transfers, water rights, etc. Ironically, the Secretary's implementation strategy for the BRC report noticeably avoids any incentive recommendations beyond those "*...that would result from the siting, construction, and operation of such a facility in their communities.*" However, the resources of all major federal Departments or agencies could influence respective departmental activities in any host state. Within this context there are things the Executive Branch could direct through other Departments and agencies and those actions that will occur as a result of program execution. Each of these processes should be considered from policy perspectives that support waste storage/disposal and would vary from site to site and the respective local community and state.

The Nuclear Waste Policy Act, as written, includes provisions for "oversight authority" and "payments equal to taxes," but with regard to the proposed expanded "benefits process" in Nevada's case, this process could be addressed in four major areas:

- ***Water:*** The western watershed allocation of water resources, coupled with desalinization plants on the California coast, could be revised to provide more water to Nevada, eliminating the need for the Southern Nevada Water Authority pipeline from northern Nevada.
- ***Land transfers:*** Eighty-seven percent of Nevada is managed by the federal government. That percentage could be changed with mutual consent by executive decree.
- ***Program implementation activities:*** Implementation of the program is planned to include building a railroad and the repository itself. Economic benefits and activity would result from the siting, construction and operation of storage and/or disposal facilities.
- ***Direct payments:*** The existing law includes provisions for direct cash payments. That potential remains, but would have to be revisited and negotiated
- Provide Nevada and its local communities between \$200 million and \$500 million per year to accept the burden of hosting the repository and storage at the repository, paid for by some combination of:
 - resolving the existing litigation on NWPA fees for nuclear waste that has a current estimated Federal taxpayer liability of \$500 million per year, and
 - if necessary, increase the 1/10 of a cent fee per kilowatt-hour of nuclear generated electricity by 50% to generate an additional \$375 million per year to cover the cost of incentives

Both Nevada and Congress need to act. A consent based process that includes a way to lock in complementary state and local consent similar to the existing provisions of the NWPA must include an incentives framework. Beyond safety and security concerns, States and

local communities should be fully aware of what they would be agreeing to when they commit to hosting a storage or disposal site.