UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Atomic Safety and Licensing Board

Before Administrative Judges:

ASLBP BOARD 09-876-HLW-CAB01 William J. Froehlich, Chairman Thomas S. Moore Richard E. Wardwell	ASLBP BOARD 09-877-HLW-CAB02 Michael M. Gibson, Chairman Alan S. Rosenthal Nicholas G. Trikouros	ASLBP BOARD 09-878-HLW-CAB03 Paul S. Ryerson, Chairman Michael C. Farrar Mark O. Barnett

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	**Docket No. 63-001**
	)	
(High Level Waste Repository)	)	**June 8, 2009**

STATE OF NEVADA'S NEW CONTENTIONS BASED ON DOE'S FEBRUARY 19, 2009 LICENSE APPLICATION UPDATE

Honorable Catherine Cortez Masto
Nevada Attorney General
Marta Adams
Chief, Bureau of Government Affairs
100 North Carson Street
Carson City, Nevada 89701
Tel: 775-684-1237
Email: madams@ag.nv.gov

Egan, Fitzpatrick & Malsch, PLLC
Charles J. Fitzpatrick *
Martin G. Malsch *
John W. Lawrence *
12500 San Pedro Avenue, Suite 555
San Antonio, TX 78216
Tel: 210.496.5001
Fax: 210.496.5011
cfitzpatrick@nuclearlawyer.com
mmalsch@nuclearlawyer.com
jlawrence@nuclearlawyer.com

*Special Deputy Attorneys General

TABLE OF CONTENTS

I. INTRODUCTION

On March 13, 2009, the three Construction Authorization Boards (CABs) appointed in this proceeding entered an Order "Clarifying CAB Case Management Order #1." In that Order, the CABs stated that new contentions arising from DOE's February 19, 2009 Updated LA "shall be deemed timely if filed within 30 days from the date of the CABs' initial order [dated May 11, 2009] identifying the parties and admitted contentions." In accordance with the Notice of Hearing, and 10 C.F.R. 2.309, and the CABs' March 13, 2009 Order, the following new contentions are hereby filed, each of them addressing information contained in DOE's February 19, 2009 LA Update. NEV-SAFETY-205 is supported by the affidavits of Dr. Gene Smith and Dr. Mike Thorne, attached as Attachments 1 and 2.

NEV-SAFETY-204 - PROBABILISTIC VOLCANIC HAZARD ANALYSIS UPDATE EXPERT ELICITATION

1. A statement of the contention itself

SAR Section 5, Subsections 5.1, 5.4, 5.4.1, and similar subsections, and QARD 2.2.9, 2.2.13.B.7, and similar subsections, which describe DOE's conduct of an expert elicitation relating to a Probabilistic Volcanic Hazard Analysis – Update (PVHA-U) that is directly relied upon in its License Application Update No. 1 (as well as the expert elicitation itself, "Probabilistic Volcanic Hazard Analysis Update (PVHA-U) for Yucca Mountain, Nevada" (09/02/2008), LSN# DEN001601965), disclose a methodology so contrary to that which is required and that which DOE committed to employ, as to render the PVHA-U inadequate and unusable in support of DOE's Updated License Application.

2. A brief summary of the basis for the contention

DOE asserts in SAR Subsection 5.4 that its subsequent Subsection 5.4.1 regarding the PVHA-U complies with the requirements of 10 C.F.R. § 63.21(c)(19) and the applicable portions of NUREG-1804 for the conduct of expert elicitations to be relied upon in the LA; however, DOE admits in SAR Subsection 5.4 that "the process used to conduct an expert elicitation can have a significant effect on the results of the elicitation," and, in that regard, DOE's procedure for the conduct of the PVHA-U does not meet the requirements of 10 C.F.R. § 63.21(c)(19) or the guidance of NUREG-1804 or NUREG-1563, and contradicts both the letter and the spirit of those references by employing processes for the selection of participating experts, their preparation and training, and the elicitation of their opinions, which are calculated to be biased and to result in an outcome predetermined by DOE, rather than an independent objective assessment.

3. A demonstration that the contention is within the scope of the hearing

This contention raises an issue whether DOE has complied with the NRC requirements applicable to Yucca Mountain, and falls within the scope of the hearing as specified in section II, paragraph 1 of the Notice of Hearing, including NRC guidance to which DOE has committed to comply.

4. A demonstration that the contention is material to the findings NRC must make to license Yucca Mountain

10 C.F.R. § 63.21(c)(19) requires DOE to provide a detailed description of its implementation of expert elicitation, on any occasion on which DOE elects to utilize that methodology in support of its LA. Pursuant to 10 C.F.R. §§ 63.31(a)(1) and (2), the NRC will not authorize construction of a geologic repository operations area at Yucca Mountain unless it determines, among other things, that there is a reasonable assurance and expectation that radioactive materials described in the application can be received and possessed and disposed of without unreasonable risk to the health and safety of the public. Where, as here, that determination by DOE is directly dependent upon the results of its PVHA-U, DOE's LA should be denied because its utilization of expert elicitation is flawed and inadequate.

The detailed expectations for an appropriate expert elicitation are set out by NRC in NUREG-1563 ("Branch Technical Position on the Use of Expert Elicitation in the High-Level Radioactive Waste Program , NUREG-1563" (11/01/1996), LSN# DN2002065379), and its specific bases for compliance in any instance where DOE elects to rely on expert elicitation are set out in the acceptance criteria of NUREG-1804 ("Yucca Mountain Review Plan Final Report; YMRP NUREG 1804 rev 2 final" (07/01/2003), LSN# DN2001748379). While DOE formally committed to, and claims to follow the guidance of NUREG-1563 in satisfying the requirements of 10 C.F.R. § 63.21(c)(19), DOE does not do so. DOE asserts in QARD 2.2.9 and 2.2.13.B.7

that its own expert elicitations "shall be conducted in accordance with NUREG-1563, Branch Technical Position on the Use of Expert Elicitation in the High-Level Radioactive Waste Program (Nov. 1996) with a single exception," but DOE fails to do so in its implementation of the PVHA-U, which update is adopted as a component of its License Application Update No. 1 by DOE at SAR Subsection 5.4.1. (*See* "Quality Assurance Requirements and Description" (01/31/2008), LSN# DEN001574022 at 32, 36). This contention alleges non-compliance with these regulatory provisions (and DOE's own commitments) and therefore raises a material issue within the scope of the licensing proceeding.

5. A concise statement of the facts or expert opinions supporting the contention, along with appropriate citations to supporting scientific or factual materials

After the time of its 1996 Probabilistic Volcanic Hazard Analysis (PVHA), DOE discovered or generated additional information relating to the likelihood of volcanism in the Yucca Mountain vicinity, including new aeromagnetic and ground magnetic data, which suggested the potential for an increased number of buried volcanic centers in the area. DOE performed an analysis of the new information and concluded that it was not significant; a conclusion roundly disagreed with by the Nuclear Regulatory Commission (NRC) Staff. As acknowledged by DOE (DEN001601965 at 1-2), "the NRC Staff concluded that the information DOE submitted did not provide an adequate technical basis to evaluate the likely impacts of the new aeromagnetic and ground magnetic data on the volcanic hazard estimate." As a consequence, DOE and NRC negotiated and reached a formal agreement on the "Key Technical Issue" relating to igneous activity. DOE admits (*id.*) "the agreement includes provisions for updating the PVHA expert elicitation in accordance with NUREG-1563, Branch Technical Position On The Use Of Expert Elicitation In The High Level Radioactive Waste Program." By adopting this formal agreement with respect to its conduct of the PVHA-U, DOE reconfirmed

and built upon its similar commitments elsewhere to implement the methodology of NUREG-1563. Specifically, DOE's Quality Assurance Requirement and Description (QARD) is incorporated into the LA by reference. (*See* SAR at 5.1-1). For its part, that QARD, addressing DOE's methodology for expert elicitation, mandates that any such elicitation used in the LA must be conducted in accordance with NUREG-1563 (then DOE tries to carve out a single exception to such compliance, admitting that it does not require documentation of the individual expert's rationale for revising their opinions in the face of DOE's pressure.) QARD 2.2.13.B.7, DEN001574022 at 36.. This is in addition to the guidance contained in NUREG-1804, Rev. 2, which provides that the NRC Staff will evaluate any DOE expert elicitation used to support its license application by assessing the "[e]xtent to which guidance in NUREG-1563. . . was used to perform expert elicitations." DN2001748379 at 2.5-61. Accordingly, DOE's argument that NUREG-1563 is not a NRC regulation but merely NRC guidance avails it nothing. DOE committed to employ the NUREG-1563 methodology and utterly failed to embrace its letter or spirit.

DOE attempts to portray its 2008 PVHA-U as merely a mirror image of its 1996 PVHA, with the substitution of new but insignificant information. In that regard, DOE's modification of its LA based upon its Update No. 1, which now includes the PVHA-U, is surprisingly terse. One would have anticipated that the LA update would contain a multi-page detailed discussion of the PVHA-U, its conduct and its findings, comparable to DOE's discussions in its original LA of the three expert elicitations relied upon in that document (*i.e.*, three pages discuss the PVHA; more than three pages discuss the Probabilistic Seismic Hazard Analysis (PSHA) expert elicitation; and three pages discuss the saturated zone flow and transport expert elicitation). Instead, in its LA Update, DOE rotely repeats its three page explanation of its 1996 PVHA verbatim and then,

seemingly as an afterthought, expends two sentences referencing its adoption of its new 2008 PVHA-U. Without explanation, DOE simply and incorrectly concludes that the updated PVHA results are confirmatory of its original PVHA. In fact, even a superficial review of the more recent elicitation confirms the contrary. First of all, DOE admits in the Updated PVHA (but not in its LA Update) that "there are several important differences between the PVHA-U and the original PVHA-96 studies that may contribute to the differences in the results" (DEN001601965 at x). While the 1996 elicitation focused on the frequency of intersection of the repository by an event defined as a basaltic dike, the PVHA-U analyzed the frequency of intersection of each of four different types of igneous features. Moreover, the horizon of time for the forecasts embodied in the 1996 elicitation was strictly limited to 10,000 years (which was, at that time, the regulatory standard for nuclear waste repository compliance). Because the regulatory standard changed to a 1 million year horizon (100 times longer than its predecessor), DOE's recent elicitation followed suit: "[t]o support potential future TSPA uses, the assessments made by the experts in the PVHA-U are for both 10,000-year and 1 My future time periods"; and is accordingly substantially different from its predecessor. DEN001601965 at 1-4

There are several particulars in regard to which DOE did not follow its commitment to implement the methodology in NRC's NUREG-1563. In the first instance, the elicitation preparation was characterized by the same "independent objectivity" shortcomings as was that of the PVHA and DOE's other expert elicitations. *See*, NEV-SAFETY-165, 166, and 167. The project was orchestrated, as usual by Kevin Coppersmith, long-time head of the same organization (Geomatrix) which provided the staff that selected, prepared, trained, accumulated documents for, and elucidated the opinions of the other expert panels. DEN001601965 at 1-5. DOE first claims that the selection of the expert panel for the PVHA-U was conducted "in

accordance with guidance provided in Plan for the Expert Elicitation to Update the Probabilistic Volcanic Hazard Analysis (PVHA) for Yucca Mountain, Nevada (BSC, 2005)." DEN001601965 at 2-10. DOE then goes on to detail the five steps supposedly involved in its selection of PVHA-U panel experts (DEN001601965 at 2-11). The first problem with this DOE claim is that, in fact, the members of the expert panel had already been selected in 2004, more than a year before the promulgation of the BSC 2005 "plan" supposedly relied upon. The second flaw is that DOE simply requested all the members of the 1996 panel to perform "an encore" and sit again as members of the new panel. Thus, the selection process had nothing to do with the BSC 2005 "plan" and moreover, it adopted the same flaws which had been prevalent in DOE's selection of the 1996 panel (*see* NEV-SAFETY-167).

As it turned out, two of the 1996 panel members could not participate, one having passed away and the other being too ill. Accordingly, DOE replaced the two with individuals whose background ignored the "independent" and "objective" criteria mandated by NUREG-1563. Of the two new members, Dr. Frank J. Spera had previously worked for DOE at Yucca Mountain as a member of its Igneous Consequences Peer Review Panel, where his mission was to review the technical basis for analyzing the consequences of igneous events that might affect the proposed Yucca Mountain repository; the other, Dr. Charles B. Connor, worked on probabilistic volcanic hazard assessment at Yucca Mountain under the aegis of the NRC. The fact that Drs. Spera and Connor were both paid federal employees working on the Yucca Mountain project during the interim between the initial PVHA and the Update, and just before work began on the PVHA-U, brings to mind the fact that in simply re-inviting the flawed membership of the 1996 panel to return in bulk, DOE failed to even consider the potentially conflicting engagements those

individuals may have had during the interim. Again, DOE demonstrated that its goal was not, in fact, to garner an independent and objective panel, as anticipated by NUREG-1563.

DOE pays lip service to the idea of meeting its commitment to adhere to the methodology of NUREG-1563, but it strains in attempting to do so and utterly fails. Thus, DOE claims (DEN001601965 at 2-26) that its new methodology "included" NUREG-1563 but "took advantage of the experience gained since the completion of NUREG-1563 in utilizing specific methodology components to improve the study." Had DOE then recounted a decade's worth of new methodology encountered since 1996, this assertion might have been credible (it still would have been meaningless, since DOE in its QARD and LA and its agreement with NRC to commit to follow NUREG-1563). But, it is not a decade's worth of improvements which DOE relied on; rather, DOE relied upon an expert elicitation methodology adopted in 1997, only a year after NUREG-1563, and one for which DOE was one of the lead authors. Thus, DOE admits "[t]he PVHA-U followed the procedural guidance set forth in the SSHAC report (*Budnitz et. al*, 1997) both in spirit . . . and, as applicable, in details of implementation." (DEN001601965 at 2-30). DOE specifically goes on to acknowledge it embraced the extensive expert interactions, numerous workshops and succession of elicitation interviews found in the SSHAC methodology, which have nothing to do with NUREG-1563, NUREG-1804 Rev. 2, or 10 C.F.R. 63 compliance. Translation: DOE followed a **different** methodology of its own choosing, and of its creation. In so doing, it made great efforts to justify its reasoning.

For example, DOE claimed that in following its chosen methodology it avoided utilizing "outlier experts whose interpretations are extreme relative to the larger technical community" (DEN001601965 at 2-25) and that it provided "consistent guidance throughout the project that evaluator experts should provide assessments that are representative of the larger informed

technical community" (*id.* at 2-26). DOE fails to state who appointed it or its vendor Geomatrix to be the arbiter of what is or is not "representative of the larger informed technical community." One can only assume that, satisfied with the product of the initial 1996 volcanism elicitation and the composition of its panel, DOE purposely chose the same vendor and same expert panel, confident that it would reprise its 1996 performance, and that DOE would then characterize its output as representative of the larger informed technical community. DOE suggests no basis for the conclusion that a panel of hand-picked members selected through a biased methodology by a longtime DOE contractor might somehow represent such a community any better than some totally different group of volcanism experts. Interestingly, some important observations of one of DOE's two new panel members (Dr. Connor) go unmentioned in DOE's PVHA-U report proper, but can be found buried in an appendix. Thus, Dr. Connor states "[e]very probability assessment for the Yucca Mountain region, for example, has shown that the probability of future volcanism decreases by orders of magnitude East of Yucca Mountain in areas such as eastern Jackass Flats, Yucca Flat, and Kiwi Mesa. . . . From the perspective of minimizing volcanic hazards, those areas are better suited for siting a long-term high-level waste (HLW) repository than is Yucca Mountain (YM)." DEN001601965 at D-1. Furthermore, Dr. Connor observed that volcanic hazards at Yucca would likely be reassessed in the future using improved information which could lead to changing the hazardous assessment. He insisted that "there are techniques currently extant in the scientific community that have not been used at YM [Yucca Mountain] to assess volcanic hazards . . . these state-of-the-art geophysical surveys have not been done at Yucca Mountain." *Id.,* at D-2-3. He concluded,

> Although the consideration of alternative sites is not part of my evaluation for the PVHA-U, nor is it provided for in the NWPA, it is important to realize that it is extremely doubtful that such reassessment [such as this 2008 update of 1996 work] would be necessary for a site located just 20 km to the east of Yucca

> Mountain, where volcanism has not occurred since the Miocene. It is short-sighted, especially considering the nearly inconceivable performance period of the repository, not to use the results of hazards assessments as motivation to seriously assess alternative sites on and adjacent to the NTS [Nevada test site]. Volcanic hazards exist at the site of the proposed Yucca Mountain high-level nuclear waste repository because the site is located at the edge of an active basaltic volcanic field." (*Id.*)

DOE identifies and tries unsuccessfully to explain away what is a basic philosophical difference between its expert elicitation methodology and that prescribed in NUREG-1563 (supposedly followed by DOE). Specifically, NUREG-1563 prescribes that the expert panel members and expert elicitation will articulate their independent and objective initial opinions early in the project, after reviewing the data provided to them (by presumably objective suppliers). Most importantly, NUREG-1563 anticipates that subsequent changes which an expert makes to his stated opinions will be documented, with an explanation provided by that expert regarding his or her rationale for the change (such a step is particularly important, where, as here, either the expert panel members themselves or those who inform them and provide them with data and elicit their opinions have a history of working for and supporting the license applicant). DOE itself well understood the rationale for this documentation requirement, acknowledging "the project recognizes that the NUREG-1563 recommendations for documenting the rationale behind an expert's evolving opinions derives from a legitimate concern about the effects of group dynamics on individuals' expressed judgments and the potential for one or more experts to feel pressured to modify their judgments counter to their true expert opinions. Documenting changes of opinion or judgment is one way to see if such effects, assuming they exist, result in significant changes in the results of the overall assessment." *Id.* at 2-29. DOE's methodology is the antithesis of securing an independent and objective initial opinion and documenting the reasons for any departure from it. Rather, DOE initially postpones

any documentation of an expert's opinion until the end of the process. In the meantime, after providing the experts primarily with documentation authored by DOE, DOE requires the expert panel members to participate in multiple workshops (four in the case of PVHA-U) in multiple individual interviews (three in the case of the PVHA-U), in the euphemistic language of DOE to provide "an opportunity for experts to revise their assessments . . . such that they were able to take advantage of feedback from their colleagues and feedback provided by the MDT (*i.e.*, the DOE vendor)." *Id.* at 2-25.

DOE intentionally misstates the foregoing basic philosophical divide, inaccurately asserting that "[t]he documentation methodology for the PVHA-U was fully consistent with the documentation recommendations in Step 9 in the Branch Technical Position" (*i.e.,* NUREG-1563). DEN001601965 at 2-28. DOE then sheepishly acknowledges that a difference between the documentation approach actually used in the PVHA-U and that outlined in NUREG-1563 simply "relates to the degree of detail provided regarding 'intermediate assessments' of individual experts." *Id.* DOE tries at length to justify its approach, arguing (without citing any authority for the proposition) that securing the initial opinion of an expert will somehow "anchor" that expert to such an opinion and make it more difficult for the expert to be persuaded to change his mind. Presumably, the authors of NUREG-1563 were able to weigh the risk of an expert being "tied" to his initial opinion and opted instead for a regime in which the NRC would be provided initial opinions, coupled with the rationale for experts changing their opinions in the face of withering pressure from DOE.

6. <u>There must be sufficient information to show that there is a genuine dispute with DOE, along with specific references to the portions of the LA being controverted</u>

This contention challenges SAR Subsections 5, 5.1, 5.4, 5.4.1, and similar subsections, and QARD 2.2.9, 2.2.13.B.7, and similar subsections, which describe DOE's conduct of an

expert elicitation relating to its PVHA-U that is directly relied upon in Update No. 1 of its LA, because they disclose a methodology so contrary to that which is required and that which DOE committed to employ, as to render the PVHA-U inadequate and unusable in support of updated DOE's License Application.

NEV-SAFETY-205 - PVHA-U FAILS TO ADEQUATELY CALCULATE PROBABILITY OF IGNEOUS EVENTS

1. A statement of the contention itself

DOE's Yucca Mountain license application, as amended, relies on the Probabilistic Volcanic Hazard Assessment-Update (PVHA-U) as the basis for calculations of the probability of disruption of a repository at Yucca Mountain by an igneous event, but the PVHA-U does not sufficiently integrate a comprehensive, self-consistent geologic model into probability calculations. Furthermore, SAR sections 2.3.11, 2.3.11.1, 2.3.11.2.2, 2.2.2.1.2, 2.2.2.3, 2.2.2.2.3.1 (and similar sections) and the PVHA-U do not adequately address alternative models, modern geophysical surveys, the entire 11 million year history of volcanism in the Yucca Mountain area, and do not adequately consider the Greenwater Range near Death Valley as part of the volcanic field about Yucca Mountain.

2. A Brief Explanation of the Basis for the Contention

PVHA-U essentially uses a two-dimensional spatial realization to characterize past volcanic events and predict the location of future events, which is inadequate because it is not based on the use of a coherent geological and geophysical model to obtain a fundamental scientific understanding of the intrinsically three-dimensional system and its likely evolution over time. Understanding and using a geological and geophysical model is critical for probability studies because it provides information about the source region for magmatism, areas of the lithosphere and asthenosphere where magma may reside, and flow patterns in the mantle. Although geophysical studies are mentioned in SAR subsection 2.2.2.1.2 as a way to identify and characterize the orientation of faults in the subsurface, the License Application lacks geophysical data to substantiate models proposed by DOE that use upper crustal structure and the local stress field to explain the location of volcanoes in the Yucca Mountain area. Geophysical studies are

also critical for testing and comparing deep versus shallow melting models by revealing the location of low-viscosity zones (hot or wet zones) in the crust and mantle that might contain magma or rock close to the melting temperature. Furthermore, identifying patterns of mantle circulation and the nature of the topography at the base of the lithosphere is important for describing the geometry of volcanic source zones which ultimately control the location and shape of volcanic fields at the surface.

3. A demonstration that the contention is within the scope of the hearing

This contention raises an issue whether DOE has complied with the NRC requirements applicable to Yucca Mountain, and falls within the scope of the hearing as specified in section II of the Notice of Hearing.

4. A demonstration that the contention is material to the findings NRC must make to License Yucca Mountain

10 C.F.R. § 63.31(a)(2) states that the NRC may authorize issuance of a construction authorization for Yucca Mountain if it determines that there is reasonable assurance or expectation that the materials described in the application can be disposed of without unreasonable risk to the health and safety of the public. In reaching this determination, 10 C.F.R. § 63.31(a)(3) requires the application to satisfy the requirements in 10 C.F.R. § 63.21, and the site and design to comply with Subpart E of 10 C.F.R. Part 63. 10 C.F.R. § 63.21(c)(9) requires an assessment to determine the degree to which features, events and processes of the site that are expected to materially affect compliance with Section 63.113 have been characterized, and paragraph (c)(15) requires adequate support for the models used to provide the information required in paragraph (c)(9). 10 C.F.R. § 63.114 (part of Subpart E) requires a performance assessment to be completed to evaluate the ability of the engineered barrier system along with natural barriers to meet the performance objectives of Section 63.113, and this performance

assessment must include consideration of the probability and consequences of events and processes identified under 10 C.F.R. § 63.21(c)(9), account for uncertainties, consider alternative conceptual models, and include adequate technical bases for all supporting models. This contention alleges non-compliance with these regulatory provisions and therefore raises a material issue within the scope of the licensing proceeding.

5. A concise statement of the facts or expert opinions supporting the contention, along with appropriate citations to supporting scientific or factual materials

Understanding the process of volcanism within the framework of a three-dimensional view of the volcanic system and its evolution over time is needed to make meaningful calculations of the probability of disruption of a repository at the Yucca Mountain site by volcanism. Although the PVHA-U uses different statistical techniques and includes some new data obtained after the original PVHA was released in 1996, it does not include a comprehensive and coherent model for volcanism to provide a three-dimensional view of the localization of volcanoes and volcanic fields. Moreover, License Application Update #1 relies heavily on the original PVHA and the PVHA-U is only briefly mentioned in terms of amending probability estimates. As a result, Nevada's original contentions NEV-SAFETY 150 to NEV-SAFETY 159 apply to PVHA-U and License Application Update #1. This contention focuses on important omissions from PVHA-U and concludes that the PVHA-U document is inadequate in support of License Application Update #1.

Lack of Consideration of Alternative Models:

In the PVHA-U, DOE asserts that it properly considered alternative models for volcanism, but, in reality, the focus in probability calculations is placed on the observed spatial distribution of volcanoes in the Yucca Mountain area without properly integrating a geologic and geophysical model to describe how that distribution has arisen. This results in an inadequate

basis for assessing the future spatial and temporal patterns of volcanic activity in the area. DOE admits that it lacks the geophysical perspective to develop a three-dimensional view of the lithosphere and mantle required to characterize zones beneath the Yucca Mountain area that are close to the melting point.

> Developing a best estimate of spatial density is problematic because we have only one realization of the underlying statistical process—that is, the distribution of past volcanic events—and we cannot repeat geologic experiments in a natural system. Ideally, we would have a complete geophysical model for events. If we knew the distribution of melt in the asthenosphere and lithosphere, and knew the state of the lithosphere through which magma would rise, we could better predict where volcanoes likely will form next. We lack such a complete geophysical perspective, however. Some data, for example seismic tomographic models of "slowness" in the lithosphere and asthenosphere, give an idea of where partial melting of the mantle might occur (*see, e.g.*, Zhao, 2001; Humphries, personal communication). *See* "Probabilistic Volcanic Hazard Analysis Update (PVHA-U) for Yucca Mountain, Nevada" (09/02/2008), LSN# DEN0011601965 at D-20.

DOE further asserts that the PVHA-U gave adequate consideration of alternative models. For example:

> Dr. Coppersmith stated that Dr. Eugene Smith (University of Nevada, Las Vegas) had developed an alternative model for assessing future volcanism in the Yucca Mountain region. Although asked to present his model at the workshop, Dr. Smith declined because of policy considerations, so Dr. Coppersmith briefly summarized the key aspects of the model. In this model, volcanoes in Crater Flat are considered to be part of a larger zone of basaltic volcanism that stretches from Death Valley to the Lunar Crater field in the northeast. Volcanism within this zone is characterized by coeval and episodic periods of activity. An area of deep, hot mantle may underlie the entire zone. If this hypothesis is correct, then the higher recurrence rates for volcanism observed in Lunar Crater and the Reveille Range may apply to the Yucca Mountain area. Following Dr. Coppersmith's summary, the project team discussed the spatial distribution of volcanic centers and the evidence for shallow versus deep melting in the defined zone. *See* LSN# DEN0011601965 at C-22.

This is one of the few mentions of alternative models in the PVHA-U. Based on the reports by individual experts, few mentioned a specific underlying model controlling volcanism or debated and adequately considered alternative models. For these reasons, Nevada considers contentions

that apply to deep vs. shallow melting models (NEV-SAFETY 150, 152, 156) as valid for PVHA-U as for the original PVHA.

DOE also claims that the PVHA-U panel did not rely on upper crustal models but considered a range of models including deep melting. Nevada agrees that the PVHA-U experts were introduced to alternative models. In fact, the alternative models of Nevada's expert (Smith) were presented to the experts by Dr. Kevin Coppersmith. The PVHA-U experts, although introduced to various melting models, qualitatively adopted the DOE model of shallow melting, but never quantitatively integrated it into their models. All of the experts accepted DOE's interpretation that volcanic activity decreasing in volume and number of events over the last 5 million years was an indicator of a future marked by a low probability for future eruptions in the area relevant to the proposed repository. While mentioning the concept of asthenospheric melting in the PVHA-U report, none of the experts considered the consequences of deep melting in probability calculations. In fact, every expert based probability calculations on vent location, number of events, dike dimensions and orientation and their interpretation of a region of interest. None of the experts quantitatively considered the effects of a petrologic model in their probability estimates. Nevada considers this omission as a major problem with the PVHA-U report.

Lack of Consideration of the Entire Volcanic Record:

The PVHA-U relies heavily on volcanic events that have occurred in the last 5 million years. Although some of the PVHA-U experts did include events earlier than 5 million years in their probability models, none considered long term trends or patterns of volcanism. The philosophy of using data from post-5 million year old basalt is also evident in supporting publications (*see, e.g.*, Valentine, G.A. and Perry, F.V., "Tectonically Controlled, Time-

Predictable Basaltic Volcanism from a Lithospheric Source" (02/07/2007), LSN# DN2002382703). The analysis in that paper uses geochemical indices that reflect the degree of partial melting of the mantle and shows that in the last 5 million years basaltic volcanism occurred within a trend of a steady decrease in the degree of partial melting. This evidence was used to suggest that basaltic volcanism in the Yucca Mountain area is dying and that future events will be rare. Nevada does not disagree with the conclusion that the degree of partial melting is decreasing. Our point is that if the full 11 million year record is used, two such trends are evident (*see* NEV-SAFETY 151 and 155). Therefore, volcanism is periodic thus raising the possibility of another peak of activity in the future. If DOE had looked at the entire record using the same techniques that they used for the post-5 million year period, they would have observed the same trends. Unfortunately, DOE decided not to do so.

A Larger Volcanic Field About Yucca Mountain:

The PVHA-U does not adequately consider the Greenwater Range near Death Valley in the probability analysis. Nevada's reasoning for including the Greenwater Range is provided in NEV-SAFETY 153 and is summarized below.

1. DOE is encouraged by the NRC to consider all volcanic fields within a 50 km radius of Yucca Mountain in its volcanic hazard analysis. The Greenwater Range lies within 50 km of Yucca Mountain. As stated in the NRC Yucca Mountain Review Plan (NUREG-1804, Revision 2), Review Method 2, Probability Criteria, page 2.2-11:

> Verify that probability estimates for future igneous events have considered past patterns of igneous events in the Yucca Mountain region. Evaluate the adequacy and sufficiency of the U.S. Department of Energy characterization and documentation of past igneous activity. This should include uncertainties about the distribution, timing and characteristics of past igneous activity. **Confirm that, at a minimum, documentation of past igneous activity, since about 12 million years ago, encompasses the area within about 50 kilometers (30 miles) of the proposed repository site. Give particular attention to the documentation of the locations, ages, volumes, geochemistry, and geologic settings of less**

> **than 6- million-year-old basaltic igneous features, such as cinder cones, lava flows, igneous dikes and sills.** Verify that the U.S. Department of Energy used geological and geophysical information relevant to past igneous activity contained in the literature. [Emphasis added.]

2. The basalts of the Greenwater Range are identical in chemistry, age and mineralogy to those near Yucca Mountain. This information from the original contention is summarized below:

   - Volcanic activity in the Greenwater Range is associated with at least 24 volcanic centers and occurred after about 5 million years ago, contemporaneous with activity near Yucca Mountain. *See* "Geologic Map of California – Death Valley Sheet, with Index and Stratigraphic nomenclature" (01/01/1974), LSN# DN2001741565, solo page.

   - Basalt from Death Valley is very similar in major and trace element chemistry to basalt from Crater Flat. Trace-elements usually better characterize volcanic rocks than do major elements and are considered as fingerprints that are commonly used to correlate volcanic rocks from area to area. For comparison purposes, volcanic rocks are usually normalized to a standard rock like average ocean island basalt. Plots of trace elements versus normalized concentration show characteristic patterns that can be used to fingerprint and compare rocks from different volcanic fields. Comparing Death Valley and Crater Flat basalt on such a plot shows that they share a similar pattern. Especially characteristic is low Nb and high Rb, Th and U. *See* "Report of Research Activities in 2007 Prepared to Satisfy the Requirements of a Nevada Contract for Volcanic Hazard Assessment of the Proposed Nuclear Waste Repository at Yucca Mountain, Nevada" (07/08/2008), LSN# NEV000000071 at 10-13.

   - Strontium (Sr) and neodymium (Nd) isotopes for Greenwater Range basalts (*see* Asmerom, Y., Jacobsen, S.B., and Wernicke, B.P., "Variations in Magma Source Regions During Large Scale Continental Extension, Death Valley Region, Western United States," EARTH AND PLANETARY SCIENCE LETTERS, Vol. 125 (1994) at 235-254) are identical to isotopic analyses from Crater Flat. Basalts in both areas have low epsilon Nd values (between -9.95 and -12), and high $^{87}Sr/^{86}Sr$ (0.7069-0.7073). *See* NEV000000071 at 10-13.

   - Basalts in both the Crater Flat and Death Valley areas are similar in mineralogy and contain olivine as the major phenocrysts phase. Plagioclase is rare and usually occurs as microlites in the matrix.

   In summary, the close geographic proximity to Crater Flat, similar age of eruption, similar mineralogy and major element chemistry, distinctive trace element patterns and distributions, and identical isotopic ratios demonstrate that Death Valley basalt in the Greenwater Range is closely associated with Yucca Mountain basalt. Hazard assessment

for Yucca Mountain should consider the Greenwater volcanoes near Death Valley as part of field of volcanoes about Yucca Mountain.

3. The probability of volcanic disruption of the Yucca Mountain repository block will increase by considering the Greenwater Range. The probability calculation is dependent on both the number of events (volcanoes) and the area selected to count the volcanoes. In its simplest form, the equation for the probability that an igneous event will intersect the repository is:

$$V_I = \frac{N(R,T)}{T} \cdot \frac{a_r^{\epsilon}}{A_R}$$

Equation 1 relating the probability of repository intersection V_I to the number of volcanoes (N) in area R during time T. A_r is the area of the region used to count volcanoes; a_r is the area of the repository block. *See* "Probabilistic Volcanic Hazard Analysis of Yucca Mountain, Nevada BA0000000-01717-2200-00082 Revision 0" (06/26/1996), LSN# DEN000861156, Figure/Equation 3-1 at 3-2 of 115.

Equation 1 indicates that the probability of disruption of the repository will be larger if the number of cones in the area of interest (R) is larger. However, the probability will decrease as the region used to count cones becomes larger. We estimate that by including the Greenwater Range R will increase by a factor of about 0.33, but cone counts (N) will increase by at least 24 (a factor of 2 to 3 over cone counts used by PVHA experts). Although, the larger area used to count will partially balance the increase in cone counts, the overall probability will increase (because the cone count term increases more than the area of the region).

The PVHA-U experts were provided with a map showing the locations of volcanic centers in the Yucca Mountain area including the Greenwater Range. We contend that, for the Greenwater Range, the volcano locations and number of volcanoes provided to the experts are incorrect.

What is the origin of the data provided by DOE on the volcano location map given to the PVHA-U panel of experts? The reference on the map is Luedke and Smith (1981) [*See* Luedke, R.G, and Smith, R.L. (1981) "Map Showing the Distribution, Composition, and Age of Late Cenozoic Volcanic Centers in California and Nevada," LSN# DN2001726928 at Map I-1091-C]. This map shows the distribution of volcanic rocks of various ages and the location of calderas

and selected volcanoes. The distribution of volcanic rocks and volcano locations for the Greenwater Range were taken from two maps by McAllister (1970 and 1973) and a U.S. Geological Survey Professional Paper by Drewes (1963) [*See* McAllister, James F. (1970) "Geologic Map and Sections of the Furnace Creek Borate Area, Death Valley, California," LSN# DN2001735170 at Map Sheet MS-14; McAllister, James F. (1973) "Geologic Map and Sections of the Amargosa Valley Borate Area-Southeast Continuation of the Furnace Creek Area-Inyo County, California," LSN# DN2001629338 at 2; Drewes, Harold. (1963) "Geology of the Funeral Peak Quadrangle, California, on the East Flank of Death Valley," U.S. Geological Survey Professional Paper 413, 73 p., 2 plates]. These maps and report were produced to describe the borate deposits east of Death Valley, but also included a reconnaissance version of the geology of the Greenwater Range. The basalts of the Greenwater Range were mapped as Funeral Formation and separated into lava flows and areas of scoria. Vent locations were not specifically located but were interpreted to lie within areas of scoria. Drewes (1963), however, did identify two areas of volcanic breccia as eroded volcanoes. Luedke and Smith (1981) [*See* LSN# DN2001726928 at Map I-1091-C] compiled the geology from the McAllister and Drewes maps and placed volcanic centers in the Greenwater Range based on the distribution of scoria and the location of Drewes' two volcanoes. The important point is that most of the volcano locations in the Greenwater Range on the Luedke and Smith map are based on interpretation; they did not field check to verify their presence. For the purpose of the PVHA, a part of the Luedke and Smith map was redrafted to show only the location of volcanoes. On this map, the volcano locations were only approximately located.

In summary, the map used by the PVHA panel contained interpreted volcano locations that were copied poorly from the Luedke and Smith map. The PVHA-U panel of experts was provided with a poor if not incorrect dataset.

Lack of Modern, High-Quality Geophysical Data:

Developing a three-dimensional model of volcano locations requires modern high quality geophysical data. The most valuable type of data relates to the velocity of seismic waves in the lithosphere and mantle beneath volcanic fields. Low-velocity zones reflect rock near the melting point due either to high temperature or elevated water content. Nevada agrees that some geophysical data were provided to both the PVHA and PVHA-U experts. The quality of these data can best be judged by several quotes from PVHA-U experts who are experienced in geophysical techniques. Dr. Charles Connor, a member of the PVHA-U panel and a professor of geology and geophysics at the University of South Florida stated in his PVHA-U elicitation report:

> As early as 1994, requests were made for detailed seismic tomographic studies in the YMR to assist with assessing volcanic hazards (Connor and Sanders, 1994). It is extremely unfortunate that no studies have been done. **The seismic tomographic data that are available are low in resolution and open to interpretation** (Biasi, oral communication at PVHA Workshop 1; Humphreys, personal communication). Although seismic tomographic anomalies appear to exist beneath Crater Flat and extend beneath Yucca Mountain, the DOE has not studied the YMR at the resolution available from, for instance, Northern Honshu, where such data are used in assessing potential sites for geologic high-level waste repositories (*e.g.*, Martin, et al., 2004). **I include no tomographic data in this analysis because of the low quality of available data. If high-resolution seismic tomographic data were available, the results of this hazard assessment could change considerably**. (*See* LSN# DEN0011601965 at D-33.) [Emphasis added.]

Dr. Connor also states:

> Volcanic hazards at YM will likely be reassessed in the future using improved information, and this information may change the hazard assessment. **Furthermore, there are techniques currently extant in the scientific**

> **community that have not been used at YM to assess volcanic hazards. For example, seismic tomography and magnetotellurics are two techniques that are used in Japan to assess long term volcanic hazards for potential HLW geologic repositories** (Martin, et al., 2004; Umeda, et al., 2006). Seismic tomography has revealed that along-arc variations in mantle P- and S-wave velocity correlates well with rates of volcanic activity. These data have been integrated into improved probabilistic volcanic hazard assessments. Magnetotellurics has been used to identify mid- to lower-crust magma bodies in the back-arc of Japan, in a region where no volcanism has occurred since the Mesozoic. Umeda, et al. (2006) consider this to be evidence of potential future volcanic unrest, which should be factored into probabilistic assessments. **These state-of-the-art geophysical surveys have not been done at Yucca Mountain. Some seismic tomography analysis has been performed and presented to the PVHA panel (Biasi, PVHA presentation, Humphries, written communication), but not with a sufficiently dense network of sensors or in a dedicated experiment.** (*See* LSN# DEN0011601965 at D-2, D-3.) [Emphasis added.]

Dr. Bruce Crowe a member of both the PVHA and PVHA-U panel and an expert in volcanology and geophysics stated:

> **I examined but did not use the teleseismic tomography data for assigning frequency zones because of low resolution, coarse grid size, and ambiguous interpretations.** (*See* LSN# DEN0011601965 at D100.) [Emphasis added.]

In summary, two of DOE's own experts found geophysical data provided to them to be of low resolution and not suitable for use in their probability models. Geophysical data was given low weight by the PVHA panel but several of the PVHA-U experts did use the teleseismic tomography data provided to them in their models. Modern seismic tomography data is available for the Yucca Mountain area through the EarthScope project. For example, geophysicists at Brown University and the University of Colorado have generated tomographic profiles that cross near or through the Yucca Mountain area (*see, e.g.*, Yang, Y. and M.H. Ritzwoller (2008), "Teleseismic surface wave tomography in the western U.S. using the Transportable Array component of USArray," GEOPHYSICAL RESEARCH LETTERS, Vol. 35, L04308, doi:10.1029/2007GL032278; Yang, Y. and D.W. Forsyth (2006), "Rayleigh wave phase

velocities, small-scale convection, and azimuthal anisotropy beneath southern California," JOURNAL OF GEOPHYSICAL RESEARCH, Vol. 111, B07306, doi:10.1029/2005JB004180). Data such as these should be used to test all available depth of melting models.

6. There must be sufficient information to show that there is a genuine dispute with DOE, along with specific references to the portions of the LA being controverted

This contention challenges the adequacy of the PVHA-U and SAR sections 2.3.11, 2.3.11.1, 2.3.11.2.2, 2.2.2.1.2, 2.2.2.3, 2.2.2.2.3.1 (and similar sections) for use in calculating the probability of disruption of a repository at Yucca Mountain by an igneous event. Supporting reasons are provided in Section 5 above and are summarized as follows. Despite the use of new statistical techniques in the PVHA-U, it relies on a two-dimensional realization of volcano locations. In other words, disruption probability is calculated solely on the basis of the spatial distribution of volcanoes. This approach is inadequate because it is not based on the use of a coherent geological and geophysical model to obtain a fundamental scientific understanding of the intrinsically three-dimensional system and its likely evolution over time. Understanding and using a geological and geophysical model is critical for probability studies because it provides information about the source region for magmatism, areas of the lithosphere and asthenosphere where magma may reside, and flow patterns in the mantle. Modern seismic studies that show velocity profiles to depths of 150 kilometers and outline zones of the earth's mantle that are near the melting temperature are available, but were not provided to the PVHA-U experts. Furthermore, neither the PVHA-U nor the License Application Update #1 adequately consider the entire 11 million year long history of volcanism near Yucca Mountain. The PVHA-U relies heavily on volcanic events that have occurred in the last 5 million years. Although some of the PVHA-U experts did include events earlier than 5 million years in their probability models, none

considered long-term trends or patterns of volcanism. Finally, The PVHA-U does not adequately consider the Greenwater Range near Death Valley in the probability analysis.

II. CONCLUSION AND PRAYER FOR RELIEF

Based on the foregoing, the Department of Energy's License Application should be denied.

Respectfully submitted,

Honorable Catherine Cortez Masto
Nevada Attorney General
Marta Adams
Chief, Bureau of Government Affairs
100 North Carson Street
Carson City, Nevada 89701
Tel: 775-684-1237
Email: madams@ag.nv.gov

(*signed electronically*)
Charles J. Fitzpatrick *
Martin G. Malsch *
John W. Lawrence *
Egan, Fitzpatrick & Malsch, PLLC
12500 San Pedro Avenue, Suite 555
San Antonio, TX 78216
Tel: 210.496.5001
Fax: 210.496.5011
cfitzpatrick@nuclearlawyer.com
mmalsch@nuclearlawyer.com
jlawrence@nuclearlawyer.com

*Special Deputy Attorneys General

Dated: June 8, 2009

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	**Docket No. 63-001-HLW**
	)	
(High Level Waste Repository)	)	**June 8, 2009**

CERTIFICATE OF SERVICE

I hereby certify that the foregoing State of Nevada's New Contentions Based on DOE's February 19, 2009 License Application Update has been served upon the following persons by the Electronic Information Exchange.

U.S. Nuclear Regulatory Commission
Atomic Safety and Licensing Board Panel
Mail Stop - T-3 F23
Washington, DC 20555-0001

CAB 01
William J. Froehlich, Chair
Administrative Judge
E-mail: wjf1@nrc.gov
Thomas S. Moore
Administrative Judge
E-mail: tsm2@nrc.gov
Richard E. Wardwell
Administrative Judge
E-mail: rew@nrc.gov

CAB 02
Michael M. Gibson, Chair
Administrative Judge
E-mail: mmg3@nrc.gov
Lawrence G. McDade
Administrative Judge
E-mail: lgm1@nrc.gov
Nicholas G. Trikouros
Administrative Judge
E-mail: NGT@NRC.GOV

CAB 03
Paul S. Ryerson, Chair
Administrative Judge
E-mail: psr1@nrc.gov
Michael C. Farrar
Administrative Judge
E-mail: mcf@nrc.gov
Mark O. Barnett
Administrative Judge
E-mail: mob1@nrc.gov
mark.barnett@nrc.gov

Anthony C. Eitreim, Esq., Chief Counsel
Email: ace1@nrc.gov
Daniel J. Graser, LSN Administrator
Email: djg2@nrc.gov
Lauren Bregman
Email: lrb1@nrc.gov
Sara Culler
Email: sara.culler@nrc.gov
Joseph Deucher
Email: jhd@nrc.gov
Patricia Harich
Email: patricia.harich@nrc.gov
Zachary Kahn
Email: zxk1@nrc.gov
Erica LaPlante
Email: eal1@nrc.gov

Matthew Rotman
Email: matthew.rotman@nrc.gov
Andrew Welkie
Email: axw5@nrc.gov
Jack Whetstine
Email: jgw@nrc.gov

U.S. Nuclear Regulatory Commission
Office of the Secretary of the Commission
Mail Stop - O-16 C1
Washington, DC 20555-0001
Hearing Docket
Email: hearingdocket@nrc.gov
Andrew L. Bates
Email: alb@nrc.gov
Adria T. Byrdsong
Email: atb1@nrc.gov
Emile L. Julian, Esq.
Email: elj@nrc.gov
Evangeline S. Ngbea
Email: esn@nrc.gov
Rebecca L. Giitter
Email: rll@nrc.gov

U.S. Nuclear Regulatory Commission
Office of Comm Appellate Adjudication
Mail Stop - O-16C1
Washington, DC 20555-0001
OCAA Mail Center
Email: ocaamail@nrc.gov

U.S. Nuclear Regulatory Commission
Office of the General Counsel
Mail Stop - O-15 D21
Washington, DC 20555-0001
Karen D. Cyr, Esq.
General Counsel
Email: kdc@nrc.gov
Mitzi A. Young, Esq.
Email: may@nrc.gov
Marian L. Zobler, Esq.
Email: mlz@nrc.gov
Andrea L. Silvia, Esq.
Email: alc1@nrc.gov
Daniel Lenehan, Esq.
Email: dwl2@nrc.gov

Margaret J. Bupp, Esq.
Email: mjb5@nrc.gov
Nina E. Bafundo, Esq.
Email: neb1@nrc.gov
Adam S. Gendelman
Email: Adam.Gendelman@nrc.gov
Joseph S. Gilman, Paralegal
Email: jsg1@nrc.gov
Karin Francis, Paralegal
Email: kfx4@nrc.gov
OGCMailCenter
Email: OGCMailCenter@nrc.gov

Hunton & Williams LLP
Counsel for the U.S. Department of Energy
Riverfront Plaza, East Tower
951 East Byrd Street
Richmond, VA 23219
Kelly L. Faglioni, Esq.
Email: kfaglioni@hunton.com
Donald P. Irwin, Esq.
Email: dirwin@hunton.com
Michael R. Shebelskie, Esq.
Email: mshebelskie@hunton.com
Pat Slayton
Email: pslayton@hunton.com

U.S. Department Of Energy
Office of General Counsel
1551 Hillshire Drive
Las Vegas, NV 89134-6321
George W. Hellstrom
Email: george.hellstrom@ymp.gov

U.S. Department of Energy
Office of General Counsel
1000 Independence Avenue, S.W.
Washington, DC 20585
Martha S. Crosland, Esq.
Email: martha.crosland@hq.doe.gov
Nicholas P. DiNunzio, Esq.
Email: nick.dinunziok@rw.doe.gov
James Bennett McRae
Email: ben.mcrae@hq.doe.gov
Mary B. Neumayr, Esq.
Email: mary.neumayr@hq.doe.gov

Christina C. Pak, Esq.
Email: christina.pak@hq.doe.gov

U.S. Department of Energy
Office of Counsel
Naval Sea Systems Command
Nuclear Propulsion Program
1333 Isaac Hull Avenue, SE
Washington Navy Yard, Building 197
Washington, DC 20376
Frank A. Putzu, Esq.
Email: frank.putzu@navy.mil

Yucca Mountain Project, Licensing Group, DOE/BSC
1251 Center Crossing Road, M/S 423
Las Vegas, NV 89144
Jeffrey Kriner, Regulatory Programs
Email: jeffrey_kriner@ymp.gov
Stephen J. Cereghino, Licensing/Nucl Safety
Email: stephen_cereghino@ymp.gov

Yucca Mountain Project, Licensing Group, DOE/BSC
6000 Executive Blvd., Suite 608
North Bethesda, MD 20852
Edward Borella, Sr Staff,
Licensing/Nuclear Safety
Email: edward_borella@ymp.gov
Danny R. Howard, Sr. Licensing Engineer
Email: danny_howard@ymp.gov

U.S. Department of Energy
Office of Civilian Radioactive Waste Mgmt
Office of Repository Development
1551 Hillshire Drive
Las Vegas, NV 89134-6321
Timothy C. Gunter
Email: timothy_gunter@ymp.gov

U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585
Eric Knox, Associate Director, Systems
Operations and External Relations, OCRWM
Email: eric.knox@hq.doe.gov
Dong Kim, LSN Project Manager, OCRWM
Email: dong.kim@rw.doe.gov

Morgan, Lewis, Bockius LLP
1111 Pennsylvania Ave., NW
Washington, DC 20004
Lewis Csedrik, Esq.
Email: lcsedrik@morganlewis.com
Jay Gutierrez, Esq.
Email: jguiterrez@morganlewis.com
Charles B. Moldenhauer, Associate
Email: cmoldenhauer@morganlewis.com
Brian P. Oldham, Esq.
Email: boldham@morganlewis.com
Thomas Poindexter, Esq.
Email: tpoindexter@morganlewis.com
Alex S. Polonsky, Esq.
Email: apolonsky@morganlewis.com
Thomas A. Schmutz, Esq.
Email: tschmutz@morganlewis.com
Donald Silverman, Esq.
Email: dsilverman@morganlewis.com
Annette M. White, Associate
Email: c@morganlewis.com
Paul J. Zaffuts, Esq.
Email: pzaffuts@morganlewis.com
Clifford W. Cooper, Paralegal
Email: ccooper@morganlewis.com
Shannon Staton, Legal Secretary
Email: sstaton@morganlewis.com

Carter Ledyard & Milburn, LLP
Counsel for Lincoln County
1401 Eye Street, N.W., Suite 300
Washington, DC 20005
Barry S. Neuman, Esq.
Email: neuman@clm.com

Churchill, Esmeralda, Eureka, Mineral
and Lander Counties
1705 Wildcat Lane
Ogden, UT 84403
Loreen Pitchford, LSN Coordinator
for Lander County
Email: lpitchford@comcast.net

Robert List
Armstrong Teasdale LLP
1975 Village Center Circle, Suite 140
Las Vegas, NV 89134-62237
Email: rlist@armstrongteasdale.com

City of Las Vegas
400 Stewart Ave.
Las Vegas, NV 89101
Margaret Plaster, Management Analyst
Email: mplaster@LasVegasNevada.gov

Clark County Nuclear Waste Division
500 S. Grand Central Parkway
Las Vegas, NV 89155
Irene Navis
Email: iln@co.clark.nv.us
Engelbrecht von Tiesenhausen
Email: evt@co.clark.nv.us
Philip Klevorick
Email: klevorick@co.clark.nv.us

Nuclear Waste Project Office
1761 East College Parkway, Suite 118
Carson City, NV 89706
Bruce Breslow
Email: breslow@nuc.state.nv.us
Steve Frishman, Tech. Policy Coordinator
Email: steve.frishman@gmail.com

Eureka County and Lander County
Harmon, Curran, Speilberg & Eisenberg
1726 M. Street N.W., Suite 600
Washington, DC 20036
Diane Curran, Esq.
Email: dcurran@harmoncurran.com

Nevada Nuclear Waste Task Force
P.O. Box 26177
Las Vegas, NV 89126
Judy Treichel, Executive Director
Email: judynwtf@aol.com

Talisman International, LLC
1000 Potomac St., N.W., Suite 300
Washington, D.C. 20007
Patricia Larimore
Email: plarimore@talisman-intl.com

Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708
Michael A. Bauser, Esq.
Associate General Counsel
Email: mab@nei.org
Anne W. Cottingham, Esq.
Email: awc@nei.org
Ellen C. Ginsberg, Esq.
Email: ecg@nei.org
Rod McCullum
Email: rxm@nei.org
Steven P. Kraft
Email: spk@nei.org
Jay E. Silberg
Email: jay.silberg@pillsburylaw.com
Timothy J.V. Walsh
Email: timothy.walsh@pillsburylaw.com

White Pine County
City of Caliente
Lincoln County
P.O. Box 126
Caliente, NV 89008
Jason Pitts
Email: jayson@idtservices.com

Nuclear Information and Resource Service
6930 Carroll Avenue, Suite 340
Takoma Park, MD 20912
Michael Mariotte, Executive Director
Email: nirsnet@nirs.org

Radioactive Waste Watchdog
Beyond Nuclear
6930 Carroll Avenue, Suite 400
Takoma Park, MD 20912
Kevin Kamps
Email: kevin@beyondnuclear.org

Abigail Johnson
612 West Telegraph Street
Carson City, NV 89703
Email: abbyj@gbis.com

National Congress of American Indians
1301 Connecticut Ave. NW - Second floor
Washington, DC 20036
Robert I. Holden, Director
Nuclear Waste Program
Email: robert_holden@ncai.org

Churchill County (NV)
155 North Taylor Street, Suite 182
Fallon, NV 89406
Alan Kalt
Email: comptroller@churchillcounty.org

Inyo County Water Department
Yucca Mtn Nuclear Waste
Repository Assessment Office
163 May St.
Bishop, CA 93514
Matt Gaffney, Project Associate
Email: mgaffney@inyoyucca.org

Mr. Pat Cecil
Inyo County Planning Director
P.O. Box L
Independence, CA 93526
Email: pcecil@inyocounty.us

Michael C. Berger
233 East Carrillo Street Suite B
Santa Barbara, CA 93101
Email: mberger@bsglaw.net

Environmental Protection Agency
Ray Clark
Email: clark.ray@epa.gov

Nuclear Waste Technical Review Board
Joyce Dory
Email: dory@nwtrb.gov

Intertech Services Corporation
(for Lincoln County)
P.O. Box 2008
Carson City, NV 89702-2008
Dr. Mike Baughman
Email: bigboff@aol.com

Nye County Department of Natural
Resources & Federal Facilities
1210 E. Basin Road, Suite 6
Pahrump, NV 89048
David Swanson
Email: dswanson@nyecounty.net

Lincoln County Nuclear Oversight Prgm
100 Depot Ave., Suite 15; P.O. Box 1068
Caliente, NV 89008-1068
Lea Rasura-Alfano, Coordinator
Email: jcciac@co.lincoln.nv.us

Nye County Regulatory/Licensing Adv.
18160 Cottonwood Rd. #265
Sunriver, OR 97707
Malachy Murphy
Email: mrmurphy@chamberscable.com

Mineral County Board of Commissioners
P.O. Box 1600
Hawthorne, NV 89415
Linda Mathias, Administrator
Office of Nuclear Projects
Email: yuccainfo@mineralcountynv.org

State of Nevada
100 N. Carson Street
Carson City, NV 89710
Marta Adams
Email: maadams@ag.state.nv.us

White Pine County (NV) Nuclear
Waste Project Office
959 Campton Street
Ely, NV 89301
Mike Simon, Director
(Heidi Williams, Adm. Assist.)
Email: wpnucwst1@mwpower.net

Fredericks & Peebles, L.L.P.
1001 Second Street
Sacramento, CA 95814
916-441-2700
FAX 916-441-2067
Darcie L. Houck
Email: dhouck@ndnlaw.com
John M. Peebles
Email: jpeebles@ndnlaw.com
Joe Kennedy, Chairman
Email: chairman@timbisha.org
Barbara Durham
Tribal Historic Preservation Officer
Email: dvdurbarbara@netscape.com

Susan Durbin
Deputy Attorney General
California Department of Justice
1300 I St.
P.O. Box 944255
Sacramento, CA, 94244-2550
Email: susan.durbin@doj.ca.gov

Brian Hembacher
Deputy Attorney General
California Department of Justice
300 S. Spring St
Los Angeles, CA 90013
Email: brian.hembacher@doj.ca.gov

Timothy E. Sullivan
Deputy Attorney General
California Department of Justice
1515 Clay St., 20th Flr.
P.O. Box 70550
Oakland, CA 94612-0550
Email: timothy.sullivan@doj.ca.gov

Brian Wolfman
Public Citizen Litigation Group
1600 20th Street, N.W.
Washington, D.C. 20009

Kevin W. Bell
Senior Staff Counsel
California Energy Commission
1516 9th Street
Sacramento, CA 95814
Email: kwbell@energy.state.ca.us

Jeffrey D. VanNiel
530 Farrington Court
Las Vegas, NV 89123
Email: nbridvnr@gmail.com

Ethan I. Strell
Carter Ledyard & Milburn LLP
2 Wall Street
New York, NY 10005
Email: strell@clm.com

Jennings, Strouss & Salmon, PLC
1700 Pennsylvania Avenue, N.W., Suite 500
Washington DC 20006-4725
Alan I. Robbins
Email: arobbins@jsslaw.com
Debra D. Roby
Email: droby@jsslaw.com

Steven A. Heinzen
Godfrey & Kahn, S.C.
One East Main Street, Suite 500
P.O. Box 2719
Madison, WI 53701-2719
Email: sheinzen@gklaw.com

Douglas M. Poland
Godfrey & Kahn, S.C.
One East Main Street, Suite 500
P.O. Box 2719
Madison, WI 53701-2719
Email: dpoland@gklaw.com

Arthur J. Harrington
Godfrey & Kahn, S.C.
780 N. Water Street
Milwaukee, WI 53202
Email: aharring@gklaw.com

Gregory Barlow
P.O. Box 60
Pioche, NV 89043
Email: lcda@lcturbonet.com

Connie Simkins
P.O. Box 1068
Caliente, NV 89008
Email: jcciac@co.lincoln.nv.us

Bret O. Whipple
1100 South Tenth Street
Las Vegas, NV 89104
Email: bretwhipple@nomademail.com

Richard Sears
801 Clark Street, Suite 3
Ely, NV 89301
Email: rwsears@wpcda.org

Alexander, Berkey, Williams &Weathers
2030 Addison Street, Suite 410
Berkeley, California 94704
Curtis G. Berkey
Email: cberkey@abwwlaw.com
Scott W. Williams
Email: swilliams@abwwlaw.com
Rovianne A. Leigh
Email: rleigh@abwwlaw.com

(signed electronically)
Susan Montesi

Attachment 1

Affidavit of Dr. Gene Smith

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
Atomic Safety and Licensing Board
Before Administrative Judges:

ASLBP BOARD 09-876-HLW-CAB01 William J. Froehlich, Chairman Thomas S. Moore Richard E. Wardwell	ASLBP BOARD 09-877-HLW-CAB02 Michael M. Gibson, Chairman Alan S. Rosenthal Nicholas G. Trikouros	ASLBP BOARD 09-878-HLW-CAB03 Paul S. Ryerson, Chairman Michael C. Farrar Mark O. Barnett

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	**Docket No. 63-001-HLW**
	)	
(High Level Waste Repository)	)	

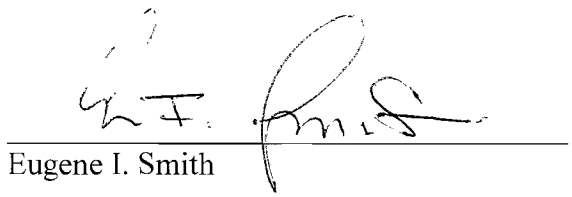
AFFIDAVIT OF EUGENE I. SMITH

I, Eugene I. Smith, the undersigned affiant, do hereby make the following statements based upon my own knowledge, information, and belief.

1. My name is Eugene I. Smith, and my curriculum vitae was attached to the Affidavit attached to Nevada's Petition to Intervene filed December 19, 2008, in the above-captioned proceeding. I am executing this Affidavit in support of the State of Nevada's New Contentions Based on DOE's License Application Update Number 1.

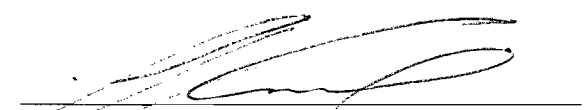
2. I hereby adopt as my own opinions the statements contained within Paragraph 5 of NEV-SAFETY-205, a contention contained in the above-named filing.

Further, the affiant sayeth not.

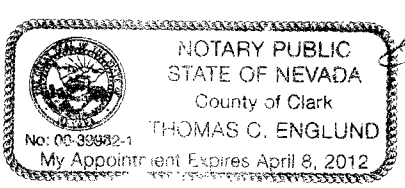


Eugene I. Smith

The above-named affiant personally appeared before me this 7 day of June, 2009, and executed this affidavit.



Notary Public
My Commission expires: 4-8-12



Attachment 2

Affidavit of Dr. Mike Thorne

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
Atomic Safety and Licensing Board
Before Administrative Judges:

ASLBP BOARD 09-876-HLW-CAB01 William J. Froehlich, Chairman Thomas S. Moore Richard E. Wardwell	ASLBP BOARD 09-877-HLW-CAB02 Michael M. Gibson, Chairman Alan S. Rosenthal Nicholas G. Trikouros	ASLBP BOARD 09-878-HLW-CAB03 Paul S. Ryerson, Chairman Michael C. Farrar Mark O. Barnett

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	**Docket No. 63-001-HLW**
	)	
(High Level Waste Repository)	)	

AFFIDAVIT OF MICHAEL C. THORNE

I, Michael C. Thorne, the undersigned affiant, do hereby make the following statements based upon my own knowledge, information, and belief.

1. My name is Michael C. Thorne, and my curriculum vitae was attached to the Affidavit attached to Nevada's Petition to Intervene filed December 19, 2008, in the above-captioned proceeding. I am executing this Affidavit in support of the State of Nevada's New Contentions Based on DOE's License Application Update Number 1.

2. I hereby adopt as my own opinions the statements contained within Paragraph 5 of NEV-SAFETY-205, a contention contained in the above-named filing.

Further, the affiant sayeth not.

Michael C Thorne
Michael C. Thorne

The above-named affiant personally appeared before me this 4th day of June, 2009, and executed this affidavit.

Hilary Garnett
Notary Public
My Commission expires: on death

HILARY JANE GARNETT
NOTARY PUBLIC
13 STATION STREET
HUDDERSFIELD
HD1 1LY
WEST YORKSHIRE
ENGLAND

Signed by MICHAEL CHARLES THORNE, identified to me by his British passport no. 060267866, this 4th June 2009, before me,
Hilary Garnett