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December 2, 2005

Secretary  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001  
Attention: Rulemakings and Adjudications Staff

To whom it may concern:

In response to NRC's Federal Register Notice of September 8, 2005 (Federal Register / Vol. 70, No. 173 /Proposed Rules, Page 53313-53320), enclosed please find the State of Nevada's formal comments on NRC's "Implementation of a Dose Standard After 10,000 Years" (10 CFR Part 63).

If you have questions regarding the enclosed comments, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert R. Loux".

Robert R. Loux  
Executive Director

RRL/cs

Enclosures

cc Nevada Congressional Delegation  
U.S. Nuclear Waste Technical Review Board  
U.S. Advisory Committee on Nuclear Waste  
Samuel Bodman, Secretary of Energy  
David R. Hill, General Counsel, U.S. Department of Energy  
Dr. Ralph J. Cicerone, President, National Academy of Sciences  
Dr. Lars-Erik Holm, Chairman, International Commission on  
Radiation Protection  
National Conference of Radiation Control Directors  
National Council on Radiation Protection and Measurements

**COMMENTS BY THE STATE OF NEVADA  
ON NRC's PROPOSED NEW LICENSING  
STANDARD FOR YUCCA MOUNTAIN**

**December 2005**

**Prepared by the Agency for Nuclear Projects  
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The State of Nevada submits the following comments in response to the Commission's Notice of Proposed Rulemaking, "Implementation of a Dose Standard After 10,000 Years," published in the Federal Register on September 8, 2005 (70 Fed. Reg. 53313). NRC's proposed rule applies solely to the licensing of DOE's proposed Yucca Mountain geologic repository for the disposal of high-level radioactive waste.

## **I. INTRODUCTION**

Before addressing the substance of the proposed NRC rule, Nevada expresses dismay at the way the rule was promulgated. NRC's proposal grew from a closely coordinated and largely secret interagency effort involving DOE, EPA, and NRC to circumvent the D.C. Circuit Court of Appeal's (the "Court's") invalidation of previous EPA and NRC Yucca Mountain standards. Those standards, drafted specifically to facilitate licensing of Yucca Mountain, included a 10,000-year compliance period that the National Academy of Sciences found would make compliance "rather easy" but had no scientific basis. *See, e.g.*, "Technical Basis for Yucca Mountain Standards," National Academy of Sciences (1995) at 55; SECY-96-120 (June 3, 1996) (in which NRC insists that Yucca standards be "reasonable" and "implementable"); EPA's "Evaluation of Potential Economic Impacts of 40 CFR Part 197" (June 2001) (in which EPA brags that its 2001 Yucca rule will have no adverse impact on DOE in its pursuit of Yucca licensing or on Yucca costs); LSN DEN001378183 (in which DOE urges OMB and EPA to adopt an "implementable" standard that "should reflect the Administration's commitment to geologic disposal, which is central to the utility's lawsuit and legislative proposals"); LSN DEN001232832 (in which a senior DOE official opines that NRC's Part 63 was "probably written by the Brocoum/VanLuik axis" and that it "may be a DOE/NRC/nuke

community juggernaut"). In fact, even senior DOE scientific experts believed the NRC 10,000 year compliance period was "fundamentally unsound." *See* LSN DEN001216767.

This interagency effort included secret meetings and exchanges of draft rule language between the regulators (NRC and EPA), meetings and exchanges with the regulated entity itself (DOE), and even the direct interference of the Office of Management and Budget ("OMB"), part of the Executive Office of the President. OMB, which has no nuclear regulatory experience, apparently ran last minute interference on behalf of DOE to further limit NRC's ability to raise legitimate safety issues in its review of the Yucca Mountain license application. As Nevada's November 2005 comments to EPA explain in detail, this secret interagency effort produced an EPA proposed rule that is arbitrary, unsupported scientifically, and unlawful in virtually every important respect. Section IX of those comments describes the collusive history of the framing of the new EPA rule.

NRC's currently proposed rule is similarly arbitrary, unsupported scientifically, and unlawful. It has a tainted and disgraceful origin. NRC violated its own "Principles of Good Regulation" – in particular "Openness" and "Independence" – when it participated in secret negotiations with DOE, its regulated entity, to limit NRC's own ability to raise legitimate and substantial safety issues. NRC's secret negotiations also violated its stated regulatory principle that "nuclear regulation is the public's business." *See* NRC Inspector General Report OIG-05-A-23 (September 30, 2005) at 14. NRC's bargaining away of its independence, abandonment of openness principles, and shameless

abdication of its regulatory responsibilities surely stands as the low point in the agency's history.

NRC Staff presented the proposed NRC rule to the Commission for its approval on August 10, 2005 (SECY-05-0144), almost two weeks before EPA published its proposed rule in the Federal Register. This lockstep coordination between EPA and NRC, which also included overlapping comment periods on the NRC and EPA proposals, makes it especially difficult for Nevada and other interested stakeholders to comment on the NRC rule. While EnPA requires consistency between the NRC and EPA rules, commenters have no way of knowing what will be the final EPA rule that NRC will have to implement. Nevada must therefore insist on the right to another round of comment before the NRC, should EPA's final rule depart substantially from its proposed rule. Because of this overlap and uncertainty, Nevada also incorporates into these comments, by reference, its entire suite of comments on the EPA rule. Those comments are accordingly attached to this document. As explained below, Nevada also believes it is entitled to a formal hearing on certain NRC proposed findings of adjudicatory fact in its proposed rule, and Nevada requests such a hearing before NRC issues a final rule.

## **II. GENERAL COMMENT**

A common initial reaction to a standard that purports to limit releases for one million years (or more) is that such a limit is ridiculous, for no one can possibly predict that far into the future. However, this reaction fails to account for the critical fact that the EPA and NRC standards at issue here are repository design standards, not release standards. Once the repository is licensed and constructed, and the radioactive waste is emplaced irretrievably (as planned), the standard will cease to have any application or

meaning. Once the man-made waste packages fail (as they inevitably will), and releases occur, the releases will obey the laws of nature, not man.

The EPA and NRC dose standards at issue here have no meaning or application except in quantitative performance assessments used in the next few years for NRC licensing purposes. These assessments use assumptions about future human knowledge, behavior and society, mathematical models, present-day scientific principles, and available scientific knowledge about Yucca Mountain and its environs to predict future releases and doses. Since the radioactive materials being disposed of have half-lives of many thousands (even millions) of years, the performance assessments must include calculations of releases of radioactive materials over very long time frames. If we confine our calculations to short time frames, then we will have scientifically reliable predictions, with little or no reliance on assumptions that cannot be proved scientifically, but we will have failed to do a calculation that tells us what we need to know -- whether Yucca Mountain will prevent or limit releases in the distant future while the wastes remain hazardous. This was the fundamental defect in NRC's and EPA's original standards. By limiting compliance calculations to 10,000 years in the face of a DOE-designed waste package claimed to last at least that long, these standards were carefully crafted to tell us nothing about whether the repository system as a whole would be adequate for safety. The repository system includes the natural features of the site, which must limit or prevent releases following eventual and inevitable package failures from corrosion.

We can be sure that some things in these long-term performance assessments will eventually turn out to be wrong as, for example, scientific knowledge increases and

human living patterns evolve. But, if we are prudent in the assumptions we make, avoid making assumptions where additional scientific studies will fill the gap, do the calculations as best as we can, and make sure the regulatory framework and design standard are right, then the calculations (performance assessments) will tell us what we need to know: whether or not there is reasonable assurance Yucca Mountain will be a safe repository that will protect future generations.

Therefore, the key question is whether compliance with a tiered design standard, including a 350 millirem/year standard applied to the median of DOE's calculations for the post-10,000-year performance assessment period, will tell us that a repository at Yucca Mountain will be safe and protect future generations. EPA, in its rulemaking, did not squarely pose this question, let alone answer it. Nevada poses it to NRC and, in view of the comments that follow, the inescapable answer is "No." NRC must do more to assure a safe repository because the EPA standard cannot adequately protect the public health and safety.

### **III. NRC'S RULE VIOLATES FUNDAMENTAL PRINCIPLES OF ADMINISTRATIVE LAW**

#### **A. Background**

NRC's proposed amendments to 10 C.F.R. Part 63 include numerous NRC proposed findings of fact that apply only to Yucca Mountain and that would otherwise be the subject of NRC's Yucca licensing review and hearing. These include proposed findings of fact:

- (1) that the performance assessment for the period after 10,000 years must use a time-independent log-normal probability distribution for deep percolation rates of from 13 to 64 millimeters per year;



- (2) that models and data used to develop FEPs ("features, events and processes") for the assessment period before 10,000 years are sufficient for the post-10,000-year assessment period;
- (3) that seismic analyses for the post-10,000-year period may be based on seismic hazard curves developed for the pre-10,000-year period;
- (4) that seismic effects in the post-10,000-year period may be limited to effects on the repository's drifts and waste packages;
- (5) that igneous effects in the post-10,000-year period may be limited to effects on waste packages;
- (6) that the effects of climate change in the post-10,000-year period may be limited to increased water flux through the repository;
- (7) that different types of corrosion of the waste packages must be considered in the pre-10,000-year period but only general corrosion at a constant rate may be considered in the post-10,000-year period; and
- (8) that effects of climate change in the post-10,000-year period may be expressed by steady state (time independent) values.

In making those determinations of adjudicative fact, NRC primarily followed EPA's lead. EPA made similar determinations in its own proposed rule, and invited NRC to do the same. However, as the discussion below shows, EPA had no authority to make those determinations, and NRC cannot ratify EPA's misuse of rulemaking or engage in similar misuse of its own.

**B. Basic Legal Principles**

Whether a particular administrative action should be classified as rulemaking or adjudication is a classic question of administrative law. A rule is the product of rulemaking, while an order is the product of adjudication. The Administrative Procedure Act ("APA") defines a "rule" as "an agency statement of general or particular applicability and future effect designed to implement...law or policy...." 5 U.S.C. § 551(4). A "rule" is contrasted with an "order," which is defined as "a final

disposition...of an agency in a matter other than rule making but including licensing." 5 U.S.C. § 551(5). Under the APA, rules typically resemble legislation, applying to classes of people, with future effect, and based on general considerations, while orders resemble judicial decisions, applying only to named parties, with present or retroactive effect, and based on facts that are specific to the parties in interest.

This classic distinction between rules and adjudications is embodied in a pair of pre-APA due process cases, *Londoner v. Denver*, 210 U.S. 373 (1908) and *Bi-Metallic Investment Co. v. State Board of Equalization*, 239 U.S. 441 (1915). In *Londoner*, the Supreme Court held that an individual property owner was denied due process when the City refused to grant him a hearing to challenge an individualized property assessment. Seven years later, the plaintiff in *BiMetallic* cited *Londoner* for the proposition that it was entitled to a hearing on an across-the-board property tax increase, but the Supreme Court disagreed. According to the court, *Londoner* was a case where a relatively small number of people were affected on individual grounds, but in *BiMetallic* no individual was singled out based on facts unique to each individual; the assessment applied to a group of people. These two cases continue to be cited today. See, e.g., *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519 (1978). In modern terminology, we now say *Londoner* involved adjudication while *BiMetallic* involved rulemaking.

The modern pronouncement on the difference between a rule (and rulemaking) and an order (and adjudication) is the 1947 Attorney General's Manual on the APA. See, e.g., *Bowen v. Georgetown University Hospital*, 488 U.S. 204, 216-225 (1988)(Scalia, J., concurring); *American Mining Congress v. Mine Safety and Health Administration*, 995 F. 2d 1106 (D.C. Cir. 1993). The Manual states that "[t]he entire [APA] is based upon a

dichotomy between rule making and adjudication...rule making is an agency action which regulates the future conduct of either groups of persons or a single person; it is essentially legislative in nature, not only because it operates in the future but also because it is primarily concerned with policy considerations....conversely, adjudication is concerned with the determination of past and present rights and liabilities." Manual at 14. The APA specifically defines licensing as adjudication because, like prototypical adjudications, licensing involves "a determination of a person's right to benefits under existing law so that the issues relate to whether he is within the established category of persons entitled to such benefits." Manual at 15. Nevertheless, it was recognized that initial licensing (as in Yucca Mountain) also resembled rulemaking because licenses "may also prescribe terms and conditions for future observance." Manual at 52. However, instead of classifying initial licensing as rulemaking, the Congress developed certain limited statutory exemptions from adjudicatory procedures in initial licensing cases. Manual at 50-53.

The foregoing discussion supports two critical distinctions between a rule and an order. First, a rule addresses the future while an order addresses the past or the present. Second, a rule is based on general policy considerations or on what are sometimes called legislative facts, generalizations about people and things, while an order is based on specific facts about things and individuals, sometimes called adjudicative facts. Whenever the courts have allowed agencies like NRC to lift issues from adjudicatory hearings and resolve them by rulemaking, the rules involved *legislative* facts and policy considerations. No agency may resolve a controversy over an adjudicative fact, relevant only to a single adjudication, by rulemaking. *See, e.g., Heckler v. Campbell*, 461 U.S.

458 (1983); *Broz v. Heckler*, 711 F. 2d 957 (11<sup>th</sup> Cir. 1983). The proposed NRC rule blatantly violates this principle.

**C. Significance of EnPA**

Nothing in the Energy Policy Act of 1992 ("EnPA") expressly amends the APA's distinction between adjudication and rulemaking. The APA provides that subsequent statutes may not be held to amend the APA unless they do so expressly. 5 U.S.C. § 559. EnPA does contemplate Yucca "rules" that by their nature depend on some facts relevant only to Yucca, and Congress is free (within Constitutional constraints) to call something a "rule" even if, under traditional administrative law principles, it would not be. However, even assuming for purposes of argument that EnPA amends the APA's definition of "rule," EnPA provides for rules that are very limited in scope. The grant of Yucca rulemaking power to EPA in EnPA is based on the previous delegation of rulemaking authority to EPA in Section 121 of the Nuclear Waste Policy Act, which in turn relies on the delegation (and division of power between NRC and EPA) in Reorganization Plan Number 3 of 1970. Therefore, EnPA authorizes EPA to issue only a Yucca-specific standard that meets the definition of a "standard" in the Reorganization Plan, *i.e.*, a rule that is confined in scope to "limits on radiation exposures or levels, or concentrations or quantities of radioactive materials in the general environment outside the boundaries of locations under the control of persons possessing or using radioactive material." EPA's findings of adjudicative facts must be limited to those needed to support such a limited rule. EPA's fact-finding exercise under EnPA must also be based on the findings of fact of the National Academy of Sciences, which made certain factual determinations to support its recommendations for Yucca Mountain standards.

Therefore, EnPA authorized only those EPA findings of adjudicatory fact that (1) are based on what the Academy considered necessary to support an EPA rule; and (2) are essential to promulgate limits on radiation exposures, concentrations, or quantities beyond the boundary of the Yucca Mountain site. The EPA proposed rule goes well beyond these limits, making findings of fact (including findings (2) through (8) summarized above). Those findings of adjudicatory fact are unauthorized and are of no legal effect. Since the EPA rule is of no legal effect in making these findings, it cannot serve as authority for NRC to make similar findings in its proposed rule.

EPA also invites the NRC to make certain findings of adjudicatory fact (finding (1) above) that it did not itself make. However, an invitation to NRC to resolve an issue by rule is not a "standard" that NRC must implement within the meaning of EnPA, even if some of EPA's other findings of fact may be considered such.

**D. NRC's Rule Violates Legal Principle**

In sum, NRC's proposed rule fails to heed the fundamental distinction between rulemaking and licensing, and cannot be justified because of EnPA. EPA's findings, NRC's proposed incorporation of them in its rule, EPA's invitation to NRC to make still additional findings, and NRC's apparent acquiescence in this invitation, also constitute massive and completely unlawful intrusions into NRC's licensing function, and involve EPA in matters well beyond its expertise. In the past, NRC has objected strenuously to this kind of EPA intrusion for these very reasons. *See, e.g.*, Memorandum for the Commissioners from the Executive Director for Operations, April 6, 1990 (LSN NRC000024406) and letter to the Administrator of EPA from NRC's Chairman, dated May 11, 1983 (LSN NRC000024461). There is no reason why NRC should now abandon its principled objection to EPA's intrusion into its licensing function.

This intrusion is even more unjustified because it apparently came at OMB's insistence. The "International Peer Review of the Yucca Mountain Project TSPA-SR" (2002) had found (at pg. v.) that the pre-10,000-year features, events and processes ("FEPs") were not necessarily reliable in predicting performance after 10,000 years, and so EPA wisely drafted a proposed rule that (unlike the current proposal) allowed NRC to propose additional FEPs in the 10,000-year assessment period. OMB, however, recommended removing that language from the rule (the OMB mark-up is in the EPA rule docket). In response, EPA obediently struck from draft section 197.36(c)(3) the phrase, "NRC may specify, by regulation, additional features, events and processes that DOE must consider because they may significantly affect the magnitude of the peak dose."

It is almost certainly the case that OMB struck the proposed language at DOE's insistence, since OMB has no expertise whatsoever in high-level nuclear waste performance assessment. This DOE-directed modification of the EPA proposal led directly to the EPA (and corresponding NRC) provisions requiring that the post-10,000-year performance assessment be based on pre-10,000-year assessment data and models, and to a corresponding need to draft a few exceptions so that NRC might consider some few additional repository safety issues where failure to do so would apparently have shocked even the conscience of the beleaguered souls involved in the secret interagency negotiation process.

Moreover, as explained in Nevada's comments on the EPA rule, especially the Appendices to these comments, these factual findings by EPA and corresponding limits on NRC's ability to raise safety issues are without any technical basis and are contrary to

sound science. They violate both EnPA and the Atomic Energy Act, and are therefore invalid for this independent reason.

**E. Effect of EPA's Intrusion and NRC's Violation of Law**

As indicated above, NRC's improper use of rulemaking to resolve adjudicatory factual issues results in: (1) matters being resolved by an agency (EPA) with no expertise; (2) a violation of fundamental principles of administrative law; and (3) an unlawful usurpation by EPA of NRC's traditional licensing function. It also constitutes an unlawful abrogation of Nevada's right, under Section 189 of the Atomic Energy Act, to an NRC licensing hearing on these factual issues. All of NRC's proposed findings of adjudicatory fact (including, specifically, findings (1) through (8)) must be struck from NRC's proposed rule.

Also, as indicated in Nevada's comments to EPA, these factual findings are premature, insofar as they are based on Yucca data and performance assessments as of 2005. The NRC (and EPA) rules must be sufficiently flexible to account for data and models used in the actual DOE license application, but as currently drafted they cannot do so. As a consequence, the NRC and EPA rules, in all likelihood, will be incapable of actually being applied as written.

Indeed, since the EPA and corresponding NRC rules are premised on ostensible findings about increased "uncertainty" and unnecessary "over-conservatisms" after 10,000 years, based on documents available to EPA in 2005, the rules could easily have the perverse effect of discouraging DOE from reducing uncertainties and adding realism to the post-10,000-year performance assessment in the license application in order to preserve the purported uncertainties and conservatisms that form the basis for the rules. Such a result would turn the practice of performance assessment on its head.

Invoking the only potentially lawful alternative to striking the factual findings from the rule, NRC could grant Nevada a formal hearing on all of the findings. Nevada believes it is entitled to such a hearing under section 189 of the Atomic Energy Act, if NRC insists on including the findings in its final rule. But such a hearing would be premature in the absence of a DOE license application.

#### **IV. NRC'S SPECIFICATION OF A DEEP PERCOLATION RATE IS UNFOUNDED**

The starting point and critical element of DOE's Yucca Mountain analyses is the water entering the Mountain. As indicated above, NRC proposes to specify that, for the post-10,000-year period, the performance assessment shall simulate climate change by assuming constant climate conditions, and that the constant value to be used shall be based on a log-normal probability distribution for deep percolation rates of from 13 to 64 mm/yr. This proposal is unsupportable.

##### **A. The Proposal Suffers from Legal and Scientific Defects**

First, as explained above, NRC's climate and infiltration proposal constitutes an improper use of rulemaking to resolve adjudicatory facts.

Second, NRC's proposal requires distinctions between the post-10,000-year performance assessment and the pre-10,000-year performance assessment that are arbitrary and have no basis in sound science. As Nevada's comments to EPA explain (especially Dr. Thorne's reports on "Climatic Considerations Relevant to the Draft EPA Rule" and "The Role of Uncertainties in Defining the Proposed Standard"), there is no step-change in our capability to project climate change at 10,000 years. Both of these reports are incorporated by reference into these comments.



Third, NRC's proposal wrongly presumes that future climate conditions at Yucca can be bounded by the observed range of conditions over past glacial-interglacial cycles, and that only long-term average responses are of relevance. In the distant future, Yucca average climate conditions could be wetter or drier than NRC's assumed constant state. Even if Yucca were to be drier on average, global warming could cause substantial reorganization of atmospheric systems, both before and after 10,000 years, leading to an increase in the number and intensity of storm events at Yucca Mountain. Intense storm events may have a disproportionate effect on infiltration because of the susceptibility of arid environments to event-driven infiltration and the highly non-linear relationships that are involved. Hydrologic response thus will be significantly underestimated by assuming steady-state hydrology based on average annual precipitation.

The Center for Nuclear Waste Regulatory Analysis ("CNWRA") confirms these propositions. *See, e.g.*, TPA Version 4.1, research by Stothoff (1999) ("The exponential response to net infiltration to climate change suggests that cumulative net infiltration may be underestimated unless perturbations in the climate cycle are considered," and "The simulations are too short to include infrequent large events, so that the estimate may not be a true mean annual average"); and Stothoff, et al. (1996). *See also* Dr. Thorne's report, "Climatic Considerations Relevant to the Draft EPA Rule," for additional considerations and details.

Fourth, the range of precipitation values assumed by NRC (up to 321 mm/yr) is lower than that used by DOE in its most recent assessment (Bechtel, 2004a), which assumes a range of up to 455 mm/yr. There is no justification for NRC's having adopted significantly lower values than those of DOE.

Fifth, current estimates of net infiltration are highly uncertain. For example, the site-specific point values reported by Flint, et al. (2002) for Yucca range from zero to several hundred mm/year. Winterle, et al. (1999), in a CNWRA report to NRC, conclude that some of the evidence used to derive site-scale estimates is biased, and that DOE estimates should be doubled. The Winterle analysis of perched groundwater suggests a most likely range of mean annual infiltration of from 13 to 26 mm/year. In contrast, the proposed rule is based on the assumption of 5 mm/year for current climate. This clearly underestimates the uncertainty in current estimates, which in turn are used in extrapolation to future climate states. Moreover, NRC fails to explain why it proposes to use the geometric rather than the arithmetic mean in its infiltration estimates, or why using a log-normal distribution in the performance assessments is appropriate.

The extrapolation of net infiltration values to future climates, as suggested under the proposed rule change, is also based on highly simplified, one-dimensional modeling and arbitrary assumptions. As noted above, the net infiltration numerical values specified under the proposed rule are based on reports by Stothoff (1999), and Stothoff, et al. (1996), which underpin the TPA Version 4.1 report. NRC uses a one-dimensional representation of the near-surface hydrological response. In the face of criticism, USGS moved from a 1D hydrological model (INFIL v1) to a model that allowed some lateral flow redistribution (INFIL v2) for the most recent assessments (Bechtel, 2004b). But recently, Woolhiser and Fedors (2000), reporting to NRC, undertook a comparative analysis based on the KINEROS model and concluded that the role of lateral distribution of runoff, and hence the re-focusing of infiltration, is significantly under-represented in INFILv2. In other words, despite moving from 1D to incorporate lateral flow in

INFILv2, the representation is still inadequate. This has important implications for the spatial distribution of net infiltration and flow processes in the unsaturated zone, and for spatially averaged response. The 1D hydrological model is not an appropriate basis with which to pre-specify hydrological response post-10,000 years.

The limitations of the underlying analyses that are used by EPA to support the proposed rule change are clearly set out by CNWRA. With respect to infiltration modeling, Stothoff (1999) page 24 notes that "[t]here are obvious limitations in the approach, as lateral redistribution, stratification, fast pathways, vegetation and matrix-fracture interactions are not considered." The limitations of the TPA analyses are also clearly defined by CNWRA (2004). Nevada notes the caveats in the TPA Version 4.1 report (CNWRA, 2004, p1-9), in which these results are reported: "The results are limited by the use of simplifying assumptions and models, and parameters based on limited data. As a consequence, these results are for illustration only. Moreover, the manner in which these analyses were conducted or the assumptions and approaches used should not be construed to express the views, preferences, or positions of the NRC staff regarding implementation of regulations at Yucca Mountain." It appears that results have been taken out of their scientific context by NRC in an attempt to substantiate an arbitrary and unjustified rule. The TPA code is designed to be used "as a tool to assist NRC in its evaluation of performance assessments in any license application by the U.S. Department of Energy" (CNWRA, 2004, p xvii), and not to pre-empt those assessments.

Sixth, in considering long-term response, it is not sufficient to assume a stationary hydrological system. Woolhiser and Fedors (2000), in their work for NRC, comment that hydrological response under future climate states is very difficult to judge "because the

soils, vegetation and the watershed geomorphic characteristics would also change." It cannot be assumed that the effect of climate variation beyond 10,000 years is limited to water flow. However, water flow is clearly dependent on the evolution of the hydrological system on these timescales. This is a complex topic that requires proper scientific evaluation, rather than arbitrary pre-specification by NRC.

Stothoff (1999) notes that "[e]very performance assessment to date has assumed hydraulic properties and soil thickness remain constant over a glacial cycle." NRC has located sites that are analogues of Yucca Mountain and investigated soils and vegetation. Stothoff (1999) reports that "Field observations have been made that suggest that hydraulic properties have varied over glacial cycles" and goes on to describe likely effects, specifying that "during wetter portions of the glacial cycle, soil genesis processes are likely to have been enhanced, and it may be that YM soils were significantly deeper and finer-textured than at present." Drier and warmer conditions may have led to vegetation replacement and (p. 20) to "drastically-enhanced erosion over the repository footprint." He concludes (p. 23) that "changing soil texture and thickness during a glacial cycle may have a profound effect on MAI [mean annual infiltration]." Also, Stothoff (1999) states that "mean annual infiltration will have more complex behaviour over a glacial cycle when the response of mean annual infiltration to changes in soil thickness is considered as well as the response to meteorological factors."

Seventh, NRC's proposal is insupportable because it is based on the past work of USGS personnel that is the subject of continuing criminal and civil investigation due to the apparent falsification of infiltration data and associated quality assurance records. NRC's notice specifically references USGS work in its discussion of climate and

precipitation, and the percolation rate studies by Mohanty, et al. (2004), cited by NRC, and the work referenced by Mohanty, et al. and by Stothoff (1999) both indicate reliance on USGS work. Moreover, the average deep percolation rate of about 4 percent under current conditions taken by NRC as a "given" has no cited support, but must also be based on USGS studies. As the e-mails in Exhibit No. 1 hereto indicate, and as the existence of ongoing investigations suggest, these USGS studies have numerous quality assurance, modeling, and other difficulties that make them unreliable. For NRC to rely on them in specifying infiltration rates by rule is akin to estimating profit and loss ratios based on figures provided by Enron.

Eighth, there is no clear indication in NRC's proposal whether or how NRC's own guidance on establishment of infiltration rates in NUREG/CR-6565, "Uncertainty Analysis of Infiltration and Subsurface Flow and Transport for SDMP Sites," has been applied, if at all. The NUREG has important insights on how uncertainties must be accounted for and cannot be ignored by NRC.

Finally, there is no indication of any scientific peer review of NRC's calculations and judgments, contrary to the Information Quality Act ("IQA") and OMB's regulations. NRC overwhelmingly relies on EPA and indirectly on its key source, the Cohen report. The IQA imposes data quality and peer review requirements on key scientific sources that are relied upon by NRC. NRC failed to subject its key information sources to peer review.

**B. NRC's Proposal Ignores the Potential for Better Future Data**

Even if NRC's proposal had some minimal scientific validity, which it does not, specifying an infiltration rate years before DOE's license application is even filed is premature and unwise, especially given the likelihood that significant new models and

data of greater reliability will soon be available. As Dr. Thorne points out in his report on "Climatic Considerations Relevant to the Draft EPA Rule," new models are now available for projecting future climate changes, and the spatial and temporal resolution of these models is likely to be enhanced in the near future. There is no reason to exclude *a priori*, as NRC has done, potential future anthropogenic influences on Yucca Mountain climate. Moreover, DOE's October 12, 2005 "Action" memo indicates that DOE and its contractors are drafting a plan of action for "review, validation, augmentation, and replacement of USGS work products as they support infiltration models and maps." NRC cannot go forward with specification of infiltration rates when the entity most directly affected (DOE) considers its (and USGS's) infiltration data and models so unreliable that they must be replaced at considerable taxpayer expense. And how will NRC explain its rule if, in the near future, one or more of the supporting authors is indicted for crimes committed in connection with the very work NRC relies upon?

## **V. NRC MUST DO MORE TO ASSURE SAFETY**

EPA invites NRC to judge post-closure performance after 10,000 years on the median of the distribution of DOE's Yucca performance realizations, and NRC carries this concept forward in its proposed rule.

### **A. Use of the Median is Unsound and Unlawful**

In choosing the median, EPA ignored the NAS's clear recommendation to use the mean, a recommendation Congress and the Court told it to heed. This is so obvious an error that for NRC to proceed with blinders on would be extremely irresponsible. Indeed, the claimed scientific arguments in support of an abrupt switch in the performance assessments from the mean to the median as the measure of compliance at 10,000 years are simply junk science.

Moreover, applying the median to the assessment results to date will sever EPA's 350 millirem/year standard from the actual dose effects of the repository, since using the median of a positively skewed distribution effectively discounts high dose calculations. (In the Yucca Mountain case, applying a 350 millirem/year median standard is roughly equivalent to a 1000 millirem/year mean standard.) The result is a measure of compliance that is not health-based, as the law requires, because it fails to account for significant doses that exceed the standard. Using the median also discourages the important investigation of high-dose calculations, since they will have little or no effect on compliance. And it is inconsistent with prior NRC and EPA policy, with no adequate explanation. These and other problems with using the median are explained in Dr. Thorne's report, "The Role of Uncertainties in Defining the Proposed Standard," and in the report by Drs. Florence and Vasquez, "Some Comments on the Proposed Yucca Mountain Compliance Standards," which were submitted with Nevada's comments on the EPA proposed rule and are incorporated herein by reference (they were also incorporated by reference into Nevada's comments on the EPA rule).

**B. NRC Must Allow Broader Judgment in Using Assessment Results**

**1. NRC Must Consider All Relevant Information**

NRC does not carry out its responsibilities as a nuclear regulator by adopting a carbon copy of EPA's rule. That is not what NRC does in regulating reactors and it is not what it should do here.

EPA stated in the preamble to its proposed rule that "NRC has the authority to consider not only the magnitude of the peak, but also the timing and overall trends of dose projections as it evaluates the license application." 70 Fed. Reg. at 49039. NRC's

proposed rule should, but does not, discuss this important topic. Related to this is the unnecessarily prescriptive requirement by EPA that the post-10,000-year performance assessment should end at 1,000,000 years. The Academy stated that the period of geologic stability was "on the order of" one million years, and if the trends in dose projections are not clear or heading upward and geologic stability is maintained, extending the assessment beyond one million years may be required to establish the performance of the entire repository system including, especially, the natural barriers. In fact, some of DOE's results do not show a peak before a million years. One should not take these time scales too literally. The point is that the peak depends on assumptions about the corrosion of the waste packages. These assumptions are based on shaky facts. With a change in the assumptions about package corrosion, the peak that occurs in the distant future in DOE's simulation could in the real world come much earlier, in thousands or even hundreds of years. The important factor both NAS and the Court required was to capture the peak, because that is the measure of the performance of the geologic system in containing the radioactive leakage from the waste packages.

## **2. NRC Must Consider Statistical Significance**

NRC's proposed rule should, but does not, set a requirement for assuring the statistical significance of DOE's modeling results that will frame NRC's licensing decision. For the purpose of developing a set of results, DOE runs its model approximately 300 times, supposedly using random variations of the individual parameters and submodels. Since there are potentially more parameters than runs, and many potential models, this small number of runs may be insufficient to create statistically significant results. Monte Carlo calculations are known to converge very slowly. NRC's rule, therefore, should have a provision requiring DOE to prove



mathematically that its results are statistically significant. Without such proof, the results should not have any status. Furthermore, EPA and NRC should require that DOE demonstrate that adequate and verifiable controls are in place so that no high runs are rejected; otherwise, the modeling will lack transparency, and DOE will have the opportunity to selectively skew its results.

### **3. There Must be Defense-in-Depth**

EPA's extremely lax post-10,000-year standard is an envelope within which NRC must operate, not a mandated standard for the NRC. There must be defense-in-depth, which has been the *sine qua non* of NRC licensing. For example, in reactor licensing EPA sets a standard of 25 millirem/year for the allowed public radiation dose, but NRC fleshes out that standard with individual barrier requirements and a tighter radiation standard based on the ALARA principle. However, a meaningful defense-in-depth standard is missing from the NRC rule. Indeed, DOE officials confirm this. *See* LSN DEN001214905 (in which a DOE official states, "My discussions with NRC staff, who drafted Part 63, lead me to understand that the intention of the NRC re defense in depth is that no requirement is intended – whatever we do is ok with them." In the case of Yucca Mountain, the arguments for tightening EPA's standard are even stronger. In reactor licensing NRC conducts an inspection and enforcement program that can plausibly be counted on to catch and correct safety problems before they get out of control. Moreover, in the case of reactors there is a substantial body of experience; at Yucca Mountain, NRC is dealing with a first-of-a-kind repository, and errors will be irreversible after repository closure. This calls for greater caution in setting the standard. In short, a more robust treatment of multiple barriers and defense-in-depth, such as that used in nuclear power reactor regulation, is needed here.

As mentioned, the time of waste package failure is likely the most uncertain aspect of the Yucca performance assessments. There is a significant likelihood that doses approaching 350 millirem/year from waste package failure, which DOE projects to occur after 10,000 years, could well occur much earlier—within thousands or hundreds of years after repository closure. Should this happen, it will be too late to adopt additional remedial measures to reduce doses to below the 15 millirem/year pre-10,000-year standard. In other words, what is at issue is not only what happens after 10,000 years, but also what happens before then if the assumptions used in licensing turn out to be wrong. Protecting against such a contingency is exactly what defense-in-depth is all about. In acquiescing to EPA's 350 millirem/year (about 1000 millirem/year mean) standard, NRC would be approving a repository design standard that is unprecedented in its laxity.

Including a defense-in-depth requirement, especially a requirement pertaining to the expected performance of natural barriers, would offer an essential protective feature for coping with early package failure. It is called for by the IAEA recommendation (DS154, April 2005 draft) that "the overall performance of the geologic disposal system shall not be unduly dependent on a single barrier or function."

#### **4. NRC Must Reject Speculative Protection Measures**

The new rule cannot consistently exclude unlikely unfavorable contingencies and yet accept in performance evaluation protective measures proposed by DOE whose application is, at this point, purely speculative. We refer specifically to the drip shields that are part of the DOE design and are supposed to prevent early waste package corrosion by channeling dripping water around container surfaces. DOE does not plan to install these drip shields at the time it emplaces waste packages, presumably because the titanium shields are so expensive and installation of the shields would complicate

retrieval of the waste packages if that becomes necessary. DOE says it will install them before the repository is closed, which could be in three hundred years. In these circumstances, a DOE licensing commitment is essentially meaningless. There is no reliable way to commit future decision-makers on this point. Moreover, it likely will not be physically possible to maintain the passages and remotely operate the electric underground transportation system that would be necessary. On October 26, 2005, NRC acknowledged receipt of a report from CNWRA, "Structural Performance of Drip Shield Subjected to Static and Dynamic Loading," which concluded: "Results show that the drip shield as designed, and under the assumptions made in the simplified analyses, may not be able to maintain its configuration for the loadings evaluated in the report." In short, unless DOE commits to install these drip shields in the repository with the waste packages, it should not be allowed to rely on their presence in making its case for licensing.

#### **5. "Reasonable Expectation" is the Wrong Standard**

NRC must disabuse EPA of its mistaken impression that there is some significant difference between "reasonable assurance" and "reasonable expectation." NRC represented to the Court that there was no significant difference. The Court has already disposed of this issue by ruling that the parties had agreed that the two terms were "substantively identical." *NEI*, 373 F.3d at 1300-1301. In any event, this matter of implementation is clearly for NRC to decide, and not EPA.

#### **6. NRC Must Clarify that Compliance with the EPA Rule is Not Sufficient for Adequate Protection**

Section 801 of EnPA requires that NRC's regulations be modified, as necessary, to be "consistent with" the EPA final standards in Part 197. EnPA does not say that NRC

is limited to slavishly copying EPA's standards into its regulations. Nor does EnPA say that EPA's standards are themselves sufficient for safety. Indeed, EnPA's legislative history is clear that "the provisions of [EnPA] section 801 are not intended to limit the Commission's discretion in the exercise of its authority related to public health and safety." H.R. Rep. No. 102-1018 at 4446 (1992). Consistent with Congressional direction, in the last round of rulemaking on EPA's 2001 standard, NRC went to considerable lengths to independently assess the sufficiency of EPA's standards. *See, e.g.*, 66 Fed. Reg. 55733, 55754, 55756, and 55760.

NRC must also either assess the sufficiency of EPA's new proposed rule, or moot the issue by clearly stating that compliance with EPA's rule will be necessary but not sufficient for NRC licensing. An assessment of safety sufficiency will show that the EPA proposal is clearly insufficient. The reasons are explained above, in Nevada's comments on the EPA proposed rule, and in the additional comments that follow.

EPA bases its proposed 350 millirem/year median standard on so-called natural background, which includes indoor radon exposure. The use of background radiation dose at one location has never been proposed or adopted by any regulatory body as a basis for protection of human health and safety from the risks of man-made radiation imposed at another location. In fact, all radiation regulation, prior to this proposal, has its basis in the health risk of added incremental increases in dose, not existing natural background levels of radiation.

EPA not only has proposed the unprecedented use of background radiation dose in Colorado as a regulatory basis for Nevada's Amargosa Valley, but has further "cooked the books." EPA proposes to include average indoor radon dose as a constituent of so-

called "natural background," even though it is highly variable geographically, from building to building, and even within the same building, and more important, its concentration can be mitigated. EPA itself -- in fact, the very same office that promulgated the Yucca Mountain standard -- has a major program underway to mitigate the effects of indoor radon, one that the agency ignores in setting the Yucca Mountain standard. If EPA had taken reasonable account of its own radon mitigation program in making the Colorado/Amargosa Valley comparison, it would have arrived at a radiation standard about an order of magnitude lower than its 350 millirem/year standard.

According to EPA's source document, indoor radon accounts for 87 percent (or 610 millirem/year) of the 700 millirem/year average annual dose in Colorado. The proportion in Nevada, according to the same source document, is 74 percent of the average 221.8 millirem/year dose (or 164 millirem/year). According to EPA (EPA Doc. #402-K-93-008), ambient outdoor radon occurs in a range of 0.2 to 0.7 pCi/L (picocuries per liter), accounting for a background dose of from 40 to 140 millirem/year. No rational health standard can be derived from this variety in exposures even assuming, contrary to all available evidence, that the health risks from naturally occurring radiation are acceptable and that people choose where to live based on informed consideration of differences in natural radiation levels. Indoor radon exposure is highly variable, and average values for locations (such as Colorado) have little to no practical validity or relevance when compared to the projected peak doses from the Yucca Mountain repository.

EPA never provided any data supporting its assumed 350 millirem/year level of background at Amargosa upon which its standard is based. Nevertheless, without analysis

or question, NRC adopted the same unsupported assumption when it adopted EPA's proposed standard.

It is astonishing that the same organization within EPA that proposed this basis for the Yucca Mountain standard is the sponsor of a significant national indoor radon mitigation program, and a contributor to an international indoor radon mitigation program associated with the World Health Organization. Over 500,000 homes in the U.S. are known to have undergone radon mitigation and the EPA information program is expanding yearly. See <http://www.epa.gov/radon>. According to EPA, "[r]adon is estimated to cause many thousands of lung cancer deaths each year. In fact, the Surgeon General has warned that radon is the second leading cause of lung cancer in the United States. . . ." Further, "[t]he U.S. Congress has set a long-term goal that indoor radon levels be no more than outdoor levels; about 0.4 pCi/L of radon is normally found in the outside air. EPA recommends fixing your home if the results of one *long-term* test or the average of two *short-term* tests show radon levels of 4 pCi/L (or 0.02 WL [working level]) or higher. See 15 U.S.C. §2661. With today's technology, radon levels in most homes can be reduced to 2 pCi/L or below. You may also want to consider fixing if the level is between 2 and 4 pCi/L."

<http://www.epa.gov/iaq/radon/pubs/consguid.html#installtable>)

EPA describes most of Colorado as a highest potential dose zone, greater than 4 pCi/L, and Nye County, Nevada, where Yucca Mountain is located, as a moderate potential zone—2 to 4 pCi/L. (<http://www.epa.gov/iaq/radon/zonemap/nevada.htm>). In 1989 and 1990-1991 surveys, 14 percent of homes in Beatty, near Yucca Mountain, were found to exceed 4 pCi/L radon. A radon abatement program has since been established in

Nevada. <http://health2k.state.nv.us/BHPS/rhs/RadonInNevada.htm> For its Yucca standard, EPA has irrationally proposed a dose level for Nevada residents that, in a closely related part of its own regulatory program, it considers sufficiently dangerous to warrant reduction, sometimes at considerable expense. Moreover, EPA's standard is inconsistent with Congress's long range radon exposure goal and irrationally assumes that its national radon reduction program, adopted at Congressional direction, will fail.

Finally, exposures to 350 millirem/year median may well be chronic, since leaks from the repository may continue for exceptionally long periods. As Dr. Thorne points out in his "International Literature and Health Effects of an Annual Effective Dose of 350 mrem," application of EPA's 350 millirem/year standard implies a lifetime additional fatal cancer risk of almost 5 percent. Neither the NRC, nor any other regulatory body, has ever considered such a high level of risk to be acceptable. And, of course, using this as a standard for the median DOE simulation result amounts to allowing 1000 millirem/year exposure on average.

Clearly, the 350 millirem/year median standard has no rational basis, and the risk it implies is an unreasonable one within the meaning of the Atomic Energy Act. Therefore, NRC must add additional protection of the public in its Yucca licensing regulations. In a closely related NRC regulatory program, applicable to the licensing of low-level radioactive waste disposal facilities, NRC has established a performance assessment standard of 25 millirem/year. 10 C.F.R. § 61.41. Since the regulation has no specified compliance period, it applies to the peak dose, just like the Yucca standard. What possible justification can there be for NRC to accept 350 millirem/year as an

acceptable level of risk for high-level radioactive waste disposal when it has specified a dose less than one tenth of this as acceptable for low-level radioactive waste disposal?

Adoption of Nevada's suggestions herein regarding such things as using the mean value in compliance calculations and providing for defense-in-depth will add necessary elements of safety. However, ultimately, NRC must either convince EPA to adopt a more reasonable and protective standard, or NRC must add its own dose standard to supplement EPA's inadequate one. Prior NRC practice, and the practices and policies of other standard-setting organizations, indicate clearly that such a supplemental dose standard must be in the range of 15-25 millirem/year.

Finally on this point, adoption of EPA's rule with no added protections would require NRC to revisit its "S-3" rule, currently codified at 10 C.F.R. §§ 51.51. This rule currently includes the so-called "zero release" assumption that the long-term effects of disposing of spent fuel and high level waste will be essentially zero because there would be no releases that would harm people or the environment after the repository is sealed. *See Baltimore Gas & Electric Co. v. Natural Resources Defense Council, Inc.*, 462 U.S. 87, 93-94 (1982). This assumption would continue to be reasonable if the 15 millirem standard extended through the time of peak dose. But with a 350 millirem median standard (or a 1,000 millirem mean standard) applicable to post-10,000-year period, this can no longer be reasonable. The health risks implied by exposures of 350-1,000 millirem/year are far from negligible and, as noted above, are far in excess of doses NRC, EPA, and other standard-setting bodies have considered acceptable for members of the public. Lifetime doses of 350-1,000 millirem/year, which could well occur, imply an increase in fatal cancer risk of about five percent or more and therefore a repository that



meets the EPA standard (but nothing more stringent) will cause many thousands of additional fatal cancers. Moreover, with no reprocessing available or even likely, there is no basis for assuming the zero release assumption is counterbalanced by other conservatisms in the S-3 rule. However, amending the S-3 rule would be completely unnecessary if NRC were to adopt more reasonable and suitable protective standards.

**C. NRC's FEP Limitations are Unreasonable**

Elsewhere in these comments, Nevada has objected to NRC's self-imposed limits on its ability to raise significant safety questions, especially its limits on FEPs. In its previous rule, NRC insisted that DOE develop a "clear technical basis for the event sequences included/excluded," 66 Fed. Reg. 55741, and NRC does not and cannot explain why it has retreated from this sound technical position.

For the most part, these limits are expressed in proposed § 63.342(c). However, proposed § 63.114(b) appears to include another limit on post-10,000-year performance assessments. The limit (if it is intended as such) is left entirely unexplained. Either it should be deleted, or NRC should offer some explanation and justification for it in another round of rulemaking so that Nevada can offer useful and informed comments.

Within proposed section 63.342(c)(ii), NRC permits limiting the effects of a volcanic event "to that causing damage to the waste package directly." In DOE's analyses waste packages begin failing after 10,000 years, and by one million years most, if not all waste packages will have completely failed. There is no credible safety rationale supporting NRC's directive that the effects of an igneous event directly impacting bare spent fuel need not be analyzed after the containers have failed.

**VI. INCORPORATION BY REFERENCE OF NEVADA'S COMMENTS ON EPA'S PROPOSED YUCCA RULE**

NRC's proposed Yucca radiation protection rule adopts almost in its entirety EPA's proposed Yucca radiation protection rule. Nevada has filed extensive comments and appendices criticizing EPA's proposed rule. As discussed above, Nevada incorporates by reference its entire set of comments on the EPA rule, which are submitted with these comments, to the extent those comments relate to any part of EPA's proposal that was also proposed by NRC. Those EPA comments and appendices should be considered by NRC as essential elements of Nevada's comments on NRC's proposed rule. Moreover, to the extent NRC considers some of the above comments to be outside of the scope of this rulemaking, Nevada requests that these comments be considered as a petition for rulemaking.

\* \* \* \*

# Exhibit 1

04/03/98 04:19:40 PM

To:

CC:

Subject: Infiltration and UZ flow

I have some maybe bad and maybe good news that you should be aware of. [redacted] called me 2 weeks ago and said that he had tested the first sample of core from [redacted] at [redacted] and it had a concentration of 39 mg/l of chloride. This means that the flux is at most 2 or 3 mm/yr in this high infiltration zone ([redacted] is at the crest of YM). There are some implications that I did not realize until I talked them over with [redacted] yesterday: basically, either our infiltration model is wrong or our [redacted] flow model is wrong or both.

Infiltration model wrong? If we look at 2 analog sites, we see much different behavior than predicted by our infiltration model. At [redacted], the best estimate for infiltration is about 24 mm/yr in the center, under a wash, decreasing to about 10 mm/yr a mile away, decreasing to virtually nothing around G-tunnel (the southern edge). Also, the [redacted] method predicts a recharge of -20 mm/yr. Our infiltration model predicts about 40 mm/yr--our [redacted] climate.

At [redacted], the [redacted] and [redacted] site in [redacted], there are drips in 2 parts of the tunnel: under a perched water body and under a wash. The drips under the wash are significant, but only immediately after the wash is flowing. Our infiltration model has virtually no infiltration in washes; what infiltration there is in washes is basically put there as a fudge factor. (I don't want to be too critical here--I could probably tear apart any of our models. Did somebody say seepage? And [redacted] did do us a great favor n helping us out for [redacted]) [redacted]-flow model wrong? Looking at the same analog sites, we see that flow is not ubiquitous. It is in isolated paths, typically associated with locally saturated conditions. If flow is in isolated paths, we would get high chloride in the [redacted] almost everywhere we look (amd

14

From: [redacted]

PostedDate: 05/11/1998 03:44:35 PM

SendTo: [redacted]

CopyTo:

ReplyTo:

BlindCopyTo:

Subject: [redacted] Flow (+climate+infiltration) section for [redacted] document

Body:  
FYI. Still don't know quite how to handle the air temp glitch. I'm continuing to keep mum about this, but, from a scientific integrity standpoint, it is tempting to let the end users know exactly what was provided to them in terms of effectively cooler future climate simulations. Problem is, I don't know how to do this without looking bad. If we can let it all pass without trying to attach DTN numbers to these results (the preferred choice), then I can forget about it and just concentrate on getting results out for the new model. If they (DOE) force us to put DTNs on these things, I would rather the truth come out sooner than later.

Don't need to respond to this, we can talk about it later.

Forwarded by [redacted] on 05/11/98 12:24 PM

From: CN=[REDACTED]/OO=YM/O=RWDOE  
PostedDate: 10/29/1998 07:41:37 PM  
SendTo: CN=[REDACTED]/OO=YM/O=RWDOE@CRWMS  
CopyTo:  
ReplyTo:  
BlindCopyTo:  
Subject: Re: Design Features 23/24 - Period of Effectiveness

Body:  
enjoyed the ranting and raving. We're trying to work with the engineers because that's where the funding's going. Leveling the top of the mountain seemed humorous but it gave me the chance to make some more cool figures. This little task is history now. Wait till they figure out that nothing I've provided them is QA. If they really want the stuff they'll have to pay to do it right.

To: [REDACTED]  
Cc: [REDACTED]  
11/05/1998 08:44 PM

This email is currently marked "Relevant and Not Privileged"

These references are pretty cool. Thanks for leaving them, it looks like usable stuff. Why can't I do this? What's my problem?

Well, maybe its that I'm just now getting the stupid data package off to the correct person. I re-sent it to [REDACTED], who responded from a laptop in [REDACTED] that I should just re-send it to [REDACTED] which I just did. Pretty soon the QA experts will want to know where the [REDACTED] and [REDACTED] precip files came from.

Here they are: [REDACTED] Don't look at the last 4 lines. Those lines are a mystery that I believe somehow relate to the work [REDACTED] was doing in entering the 1994 data. These lines are not used by [REDACTED] (we stop at 9/30/84). I've deleted the lines from the "official" QA version of the files (which do not need them). In the end I keep track of 2 sets of files, the ones that will keep QA happy and the ones that were actually used.

These files are the output from the [REDACTED] database that [REDACTED] and I had put together, which I still have but haven't looked at since 1995. So either the [REDACTED] data package has to look a lot like those files or I'm going to have start talking about the [REDACTED] database when the QA questions start. My guess is that we do not want to deal with the [REDACTED] database.

Here it is almost 2000, and I am still struggling with work done in 1995 and 1996.

12/17/98 06:57 PM  
Sent by: [REDACTED]  
To: [REDACTED]  
cc:  
Subject: Re: [REDACTED]

FYI: The work plan PA has put together as a result of the meeting this week includes model hand-offs (TBVs documented using NLP 3-15s) which will all eventually be QA'd using [REDACTED] (see attachment below). [REDACTED] is going to be the PA lead on the [REDACTED] for the FY98 model. We're not sure how smoothly this is going to go but this is the approach. Like you've said all along, YMP has now reached a point where they need to have certain items work no matter what, and the infiltration maps are on that list. If USGS can't find a way to make it work, [REDACTED] will (but for now they are definately counting on us to do the job). [REDACTED] totally supports paying for a USGS report on the FY98 model, but they fully realize the problems we're having with the Director's approval thing.

I've had no response from [REDACTED] concerning my response to his request for an FY99 work plan using the close-out funds. [REDACTED] has indicated that I can charge all my time this year to the 10506 account. There was also good indication this week that [REDACTED] is willing to support us in FY00 to continue on with model validation and uncertainty work, and to deal with FEPs addressing the infiltration maps. The 110k provided to USGS was in direct response to the telecon and was specifically intended for infiltration modeling work. I can no longer wait for USGS to figure this out; I'm moving ahead according to the [REDACTED] work plan we put together this week.

What I really need now are some warm bodies to review the work I've been doing. Like [REDACTED] said, "Live by the sword, die by the sword!"

From: [REDACTED]  
PostedDate: 12/18/1998 05:25:24 PM  
SendTo: [REDACTED]  
CopyTo:  
ReplyTo:  
BlindCopyTo:  
Subject: Re: AP [REDACTED]  
Body:

Wow! Thanks for this very thoughtful and philosophically charged wealth of advice. I here exactly what you say. YMP is looking for the fall guys, and we are high on the list. I got a strong feeling at the [REDACTED] meeting that high level folks are starting to pay very close attention to who they will come after when things hit the fan. Who got how much funding at what time will all be long forgotten when the lawyers start challenging credibility of results. It was made clear that this will be like the OJ trial, where results are completely thrown out because of minor procedural flaws or personal attacks on credibility. As [REDACTED] told the lawyer who was there, YMP doesn't stand a snowball's chance in hell of making this work if that is the approach. As far as the 98 and 99 modeling, I'm starting the write-ups now. Much of this is already being covered in the NLPs and APs so I can kill 2 birds with the same stone. I much as I think [REDACTED] may help us out with some things, I am going to be very careful that [REDACTED] doesn't end up taking credit for our work.

12/17/98 08:47 PM  
To: [REDACTED]  
CC:  
Subject: Re: AP 3.10Q

I agree with your analysis. We only win if we get the final product out. I have to think through this carefully but where I'm headed is this. [REDACTED] and I will make sure we get the 96 report done (you need to call [REDACTED] ASAP, just in case she needs input from you on Friday). You, on the other hand, need to start the FY99 report, assuming the FY96 gets approved. You need to lay out the changes you've made to the model, how you've tested or calibrated those changes (stream gage, neutron (I've already started working on a new neutron hole analysis which I had hoped to finish this vacation but won't be done until later I'm sure)), what the results are, and what difference it makes. Do this for the site scale as your basis for the change to the model and as the basis of the report. Then start another report, which uses the first report, to lay out the regional model. Both report will address past and future climates. That's where I'm heading but I'm not there yet. We can discuss this tomorrow.

X  
The bottom line is forget about the money, we need a product or we're screwed and will take the blame. EVERYBODY will say they told us to go ahead without a plan or budget in place (even though [REDACTED] said no hires). This is now CYA and we had better be good at it. I seem to have let this one slip a little too much in an attempt to cover all our work (and get us the hell out of the long term problem of Yucca Mountain) but now it's clear that we have little to no choice. In all honestly I've never felt well managed or helped by the USGS YMP folks, in fact, as you know, I've often felt abandoned. This time it's no different, or worse, and we have to work together to get out of this one. I'm still overwhelmed trying to protect the rest of the program from the ravages of what's happening in [REDACTED] (funding, which we seem to be blamed for because we got funding) and the current [REDACTED] fiascoes in the [REDACTED]. That is to say we're not working on our own as we have for the past 12 years, now were being threatened (and carefully watched) by the people who use to simply ignore us. These are very dangerous time, both funding wise and professionally. Mark my words on this one, it will not be long before our technical credibility will be challenged in an attempt to discredit us and redirect funding!

Oh, by the way, you did a great job in response to [REDACTED] request. Bravo!!

(keep my last paragraph private or among friends, if you know who they are)

To: [redacted] Tucson, AZ [redacted] gov  
cc: [redacted]  
03/15/1999 12:18 PM Subject: Re: Tiger Team Hell

This email is currently marked "Relevant and Not Privileged"

[redacted] and I have been trying to figure out what's really coming at us with the tiger team effort. So far we've learned that they don't have a solid plan of action yet. I've formulated a "potential impact list" that is prioritized according to what work gets impacted 1st; 1. FY99 support to [redacted] (includes all the workshop stuff), 2. regional recharge report, 3. site-scale infiltration modeling report. Some of the work the tt effort calls for was scheduled under 22001 QA anyway, but we started hearing rumors of things like re-doing all the QA work for the neutron logging data, which will stop us dead in the water.

Now I'm going to give you the inside scoop: I'm going to continue the regional modeling, even if it means ignoring direct orders from YMP management. I'm also going to be working on reports, even if it means ignoring direct orders from YMP management. [redacted] and I have a pretty clear vision of the type of work that needs to be done to stay alive for the long-haul, and it very definitely involves getting product out there for the users and the public to see. The Death Valley regional modeling work fits that bill. Screwing around with tiger teams does not. In the end, its going to be the reports that move everything else forward. Tiger team efforts will just be vaporized.

So, the work may be slowed, but I will not let it stop. At this point, I am still working to the plan that we've all spent a significant amount of time on to make things happen for FY99. That's the insider scoop. The position we will take for the [redacted] planners may be much different. So delete this memo after you've read it.

From: [redacted]  
PostedDate: 03/15/1999 10:14:50 PM  
SendTo: [redacted]  
CopyTo: [redacted]  
ReplyTo: [redacted]  
BlindCopyTo:  
Subject: Re: [redacted] Hell  
Body:

This memo actually hits the nail on the head. You are exactly right: One, yes, we will do the work, Two, yes, screw the tiger team (I don't know how yet but I'll figure it out), Three, yes, destroy this memo!

03/15/99 12:18 PM  
To: [redacted]  
cc: [redacted]

Subject: Re: [redacted] Hell

[redacted] and I have been trying to figure out what's really coming at us with the tiger team effort. So far we've learned that they don't have a solid plan of action yet. I've formulated a "potential impact list" that is prioritized according to what work gets impacted 1st; 1. FY99 support to [redacted] (includes all the workshop stuff), 2. regional recharge report, 3. site-scale infiltration modeling report. Some of the work the tt effort calls for was scheduled under [redacted] QA anyway, but we started hearing rumors of things like re-doing all the QA work for the neutron logging data, which will stop us dead in the water.

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So, the work may be slowed, but I will not let it stop. At this point, I am still working to the plan that we've all spent a significant amount of time on to make things happen for FY99. That's the insider scoop. The position we will take for the [redacted] planners may be much different. So delete this memo after you've read it.

[REDACTED]  
From: [REDACTED]  
PostedDate: 04/22/1999 09:52:39 PM  
SendTo: [REDACTED]  
CopyTo:  
ReplyTo:  
BlindCopyTo:  
Subject: status of new climate net-infiltration modeling  
Body:

I thought I'd give you a "heads up" on the progress of work I've been doing with the results you've provided. Model simulations have been in progress but about 3 weeks ago I found a small error in the model input that was generated using the [REDACTED] data. The error was minor but would have created a QA nightmare so this was fixed and the simulations are being re-done (I'll send you a summary of the results when I get to this point).

I am about to submit a "developed datapackage" milestone consisting of the climate input files (7 files for the 7 sites you identified) that are being used by the net-infiltration model. The input files are basically re-formatted [REDACTED] export files with a minor amount of parameter estimation occurring to fill small gaps in the record (even for the high ranking sites, there are gaps all over the place).

Here's the weird news; to get this milestone through QA, I must state that I have arbitrarily selected the analog sites. At first, I was going to include your email as supporting information in the data package, and discuss the work we did using the worksheets consisting of candidate sites, but since there is no [REDACTED] for your results the message I am getting from QA is that I can't use or refer to those results. In other words, I was trying to give you credit for your part in all this, as well as provide all info possible for the traceability of the analog climates, but this seems to create problems rather than solving them.

So for the record, the seven analog sites have been arbitrarily (randomly) selected. Hopefully these sites will by coincidence match the sites you have identified.

P.S. please destroy this memo

[REDACTED]  
From: [REDACTED]  
PostedDate: 04/23/1999 08:56:58 PM  
SendTo: [REDACTED]  
CopyTo:  
ReplyTo:  
BlindCopyTo:  
Subject: [REDACTED] help  
Body:

I have to run this by you because I promised [REDACTED] and [REDACTED] that I would get back to them with a game plan next week:

[REDACTED] and [REDACTED] are pushing me to get the QA work in place for the products they need from me and are suggesting that they can help me out with software QA issues and all the grunt work required to just do the modeling runs so that needed products can be finished for the modelers to use. They realize that I am somewhat overloaded with this task so they are willing to provide us resources in terms of computing power and warm bodies doing QA and running the code. The catch for us is that the [REDACTED] code will be on [REDACTED] (they can dedicate [REDACTED] to do the number crunching.... they will give us accounts so that we can [REDACTED] to these machines). I have been given a verbal promise that we will not lose control of the code, and the goal is to get the job done, not to take over our work. The [REDACTED] personnel would in essence be working for us, not the other way around.

I am thinking that if I want to remain viable player on YMP (which may translate to continued funding), I need to show that we can get the job done and provide the modelers with the results they need. This is not going to happen if I rely solely on USGS YMP resources. For example, [REDACTED] can dedicate a person to do all of our software configuration management stuff and help us out with input parameter QA issues. This strategy sounds much more appealing to me now because I'm getting the impression that unlike USGS QA, the labs have the QA resources to actually get in there and do the work, instead of just creating more work for the [REDACTED] to do.

The other option would be to stall, and then when I'm in [REDACTED] I will just ignore all this, and we can let the site scale modeling go down the tubes. Dealing with this QA bullshit is really starting to make me sick.



From: [REDACTED]  
PostedDate: 04/22/1999 06:43:32 PM  
SendTo: [REDACTED]  
CopyTo: [REDACTED]  
ReplyTo:  
BlindCopyTo:  
Subject: Re: QA  
Body:

What if you just download the raw files from [REDACTED] and say you used those? Do they need to know any more than that? You don't really need to do an analysis just say this is the data I used. Maybe that would work.

04/22/99 03:27 PM

To: [REDACTED]  
cc: [REDACTED]  
Subject: QA

The QA bullshit grows deeper. I may need to say that I did everything by hand for the data package I am submitting that You and [REDACTED] reviewed. The program I wrote is not in the system and QA will be all over it like flies on shit. All references to [REDACTED] are being deleted. Here's my question: When we go to start QA'ing the site-scale modeling work, will I get taken to the cleaners because I am not referencing either a tech procedure or a scientific notebook? In other words, would it be cost-effective to create a SN for the site-scale work and back-date the whole thing?? Can't wait to be far-far away from here!

[REDACTED] has been the main force behind dealing with the latest round of editorial reviews and pushing the report forward. When Director's approval is granted, I am assuming the FY96 model will be in the [REDACTED], although we may be required to submit additional supporting information (we are still in the process of finding this out). There is also a chance that the report will not be approved, and will require additional work and/or modifications. Unfortunately, the process of Director's approval is largely beyond our control. Past experience has shown that it is always best to assume additional work and/or modifications will be needed. At any rate we are still hoping for end of December on this, but cannot make any guarantees. If additional QA work is needed, it may become a problem because at present we are not in a good position to do this. I'd say a 50% probability of completion.

re: 96 model includes only the current climate base-case net infiltration sp, and a wet and dry year current climate simulation. We still need until April to get the 97 future climate 100-year simulations into the DMS. Again, no guarantees, especially in light of major uncertainties that continue to exist, and thus I can only give a 50% probability of completion.

Bottom line is, our position for making any FY99 commitments at all is still poor to nonexistent.

From: [REDACTED]  
PostedDate: 04/26/1999 02:40:15 PM  
SendTo: [REDACTED]  
CopyTo: [REDACTED]  
ReplyTo:  
BlindCopyTo:  
Subject: Re: Recharge Emergency  
Body:

I have the [REDACTED] files here. Not sure I know about the power-point format. Something will be sent within the next 15 minutes. Did you get the overnight. Also, much bullshit is getting generated by the developed data package you reviewed. The USGS has already far exceeded the cost benefit ratio for this product.

09/28/99 09:21 PM

To:

CC:

Thanks for the enlightenment, [redacted] I was definitely under the wrong impression on the work being done for SR and also regarding the nature of the P and T trends with a climate change.

Looking back over my emails i see that I misstated what was a discussion of changes relative to previous assumptions, NOT true out of that specific context. In fact, out of that context the opposite was true. The non-traceable and non-transparent statement after it was disconnected from its

parent context and became flat-out wrong.

Now the real question is: is the climate [redacted] going to meet the need for the [redacted] and the [redacted] to have long term climate states (and infiltration changes accompanying those states) that are defensible???

I think showing it doesn't matter from a [redacted]-dose perspective is not sufficient to establish whether or not this part of the analysis is credible and has a defensible basis. We would all agree that showing that it has no impact on system performance does lower the burden of proof necessary to support the modeling (the confidence-burden), however.

Finally, the agreement to show only 10,000 year calculations in [redacted] and [redacted] is not an agreement that DOE was aware of at the upper levels of management, and is being revisited. We will likely need to show calculations, up to peak dose if necessary, in all 3 documents, if they clarify the content of the 10,000 year calculation. This is a dialogue that needs to be had internally, but my announcing to the NRC that we would do 10,000 years only led to a very negative reaction and caused a negative counterreaction in DOE management. NRC said whatever parts of the [redacted] they need to consult to understand the 10K year calculation will need to be Q, and the reaction of DOE management on the scene was -- OK, let's put all of that in the [redacted] and [redacted] rather than make the FEIS a Q document!

01/06/2000 04:01 PM

To:

cc:

Subject: Re: AMR [redacted]

This email is currently marked "Relevant and Not Privileged"

[redacted] called. Yes, this is really happening. [redacted] and [redacted] will help but it seems I am stuck going to [redacted] on the [redacted] ([redacted] and [redacted] will also go for moral support). Responses to the [redacted] comments are due on the [redacted]

There is of course, no scientific notebook for this work. All work is in the form of electronic files. I can show auditors input, output, and program files, but it is not clear to me how to show documentation of work in progress. They may be expecting to see something that at least looks like a scientific notebook documenting work in progress. I can start making something up but then the [redacted] projects will need to go on hold.

If I continue placing [redacted] tasks as 1st priority for January, I will be ill prepared for the audit, and will likely get hammered. That's fine by me. I am far more concerned about the [redacted] projects than I am about the [redacted]. But [redacted] will be rather unhappy, and I will need help trying to figure out a good excuse why 100% of my time did not go into the audit without revealing the [redacted] projects.

I am open for suggestions.

From: [REDACTED]  
PostedDate: 03/07/2000 11:09:00 PM  
SendTo: [REDACTED]  
CopyTo:  
ReplyTo:  
BlindCopyTo:  
Subject: developed daily precip record

Body:  
believe it or not, this file is now 3.5 years old, but it is what was used. This developed record stops on day 274, 1995. The only real good thing about this file is we seem to be very close to getting it into the TDMS (the data was developed in a [REDACTED] turned to [REDACTED] worksheet that may now be required to go through qualification as a software routine, so things have yet again stalled). Someday I hope to have the time to update this to include an improved pre-1987 interpolation and all the new data after 1995, which includes some interesting events..... back to QA.  
P.S. Hope this email doesn't trigger a [REDACTED] input request. I'll probably get fired.

Attachment: [REDACTED]

03/08/2000 07:39 PM

To: [REDACTED]  
cc: [REDACTED]  
Subject: vegcov01

This email is currently marked "Relevant and Not Privileged"

[REDACTED] has a user option which when set to 0 the vegtypes in the file [REDACTED] (created by the damn routine [REDACTED]) are ignored and a veg-cover term of 30 is just assumed. The real stupid thing is that this value is never used because the veg cover stuff (root-zone parameters) all get defined in the control file. The veg-type and veg-cover columns are just dummy place holders that are not even used by [REDACTED] (remember all those great ideas about correlating something, anything, to vegetation....). But because vegcov01 is where the bedrock ks is adjusted I have to drag the routine into the AMR. Damn it!

The main stupid thing is that as a 1st step I ran [REDACTED] with the user option set 2 to create [REDACTED] from [REDACTED], the output from [REDACTED]. This setting causes a veg cover estimate to be made based on vegtyp01, which are the vegtypes defined for the regional model (data from [REDACTED] and [REDACTED]). I was desperately trying to bring vegetation into the picture (still wasn't getting what I needed from the bugs and bunny crowd) but it didn't match up as well as I had hoped, I ran out of time, and it fizzled.

Now here is the majorly stupid part. To create [REDACTED], which is used as input to [REDACTED], I re-ran [REDACTED] using [REDACTED] as input and set the option to 0. So the regional vegtypes made it into all the watershed files that were used in the AMR. Now I can't just re-write the routine to leave out vegtyp01 because the output will never match what ended up becoming the watershed files. Had I re-ran [REDACTED] using [REDACTED], I could now re-write the code in 5 minutes, get rid of [REDACTED] all together, and all would be cool.

So I would like to keep [REDACTED] as is, tell the story just as it happened, and then explain that we don't have to trace [REDACTED] because it was not used (we cannot bring [REDACTED] into the picture because then we have to deal with the input file which is the geospatial input file for the [REDACTED] region!). In fact we can just not even talk about the vegtype and vegcover stuff and just say those are dummy place holders that are never used so they don't need to be traced.

On second thought...do whatever you want. At this point I cannot re-produce the blocking ridge numbers using [REDACTED] and I have yet to re-visit the elevation stuff [REDACTED] was finding and who knows what will happen if we tried to run [REDACTED] on any of the source data going into the [REDACTED]. There is a bug in the top layer of the cascading bucket model, the soil ks conversion is off by a factor of 10, and even if I can re-produce the blocking ridges they're still wrong. Then there are those strange non-integer values that I saw for the 1st time in the Day and others input file during my testing of [REDACTED]. What is rock-type 1.33??? Oh yeah, the [REDACTED] data .... Jesus! I'm going nuts again! I'm going home now!

From: [REDACTED]  
PostedDate: 03/30/2000 06:48:01 PM  
SendTo: [REDACTED]  
CopyTo: [REDACTED]

ReplyTo:  
BlindCopyTo:  
Subject: Installations  
Body:

The programs, of course, are all already installed otherwise the AMR would not exist. I don't have a clue when these programs were installed. So I've made up the dates and names (see red edits below). This is as good as its going to get. If they need more proof I will be happy to make up more stuff, as long as its not a video recording of the software being installed.

----- Forwarded by [REDACTED] on 03/30/2000 03:39 PM -----



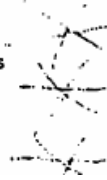
[REDACTED]  
03/30/2000 03:48 PM

To: [REDACTED]  
cc: [REDACTED]

Subject: Installations

This email is currently marked "Relevant and Not Privileged"

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MOL.19980217.1087 is incomplete in that it does not contain all the information identified as part of the Records Package Cover Sheet. An Acceptance Inspection Report is among the missing information from the record. The record also contains a procurement Final Procurement Review for the calibration of a Keithley Digital Multimeter, Model 2001 that was completed prior to the receipt of the equipment and the equipment calibration, which does not appear appropriate.

MOL.19980217.1041 does not provide as found and as left data, does not include the acceptance criteria, it is not clear which LOT number this record is for (LOT M022103??), the calibration date should be established as the date when the form is completely approved (May 15 not May 14), the "Contents of Record" field states "S/Ns 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12" when it should read ID Nos. 1 through 14, and the third page of the record contradicts pages 1 and 2 with respect to the calibration date and M.O. number (M.O. G036220 vs. M.O. G033390). The calibration date and M.O. number discrepancies would lead an auditor to believe the record had been falsified. It gives the appearance that the proper signature page is not available and another record's signature page was used in its place. In fact, the signature page is the same as attached as page 3 to MOL.19980217.1042.

ALB.20050220.2577, EML1018 :

From: [REDACTED]  
PostedDate: 04/22/1999 06:27:50 PM  
SendTo: [REDACTED]  
CopyTo: [REDACTED]  
ReplyTo:  
BlindCopyTo:  
Subject: QA  
Body:

The QA bullshit grows deeper. I may need to say that I did everything by hand for the data package I am submitting that You and [REDACTED] reviewed. The program I wrote is not in the system and QA will be all over it like flies on \$\$\$.

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Can't wait to be far-far away from here!

[REDACTED]

[REDACTED]



12/17/88 06:57 PM

Sent by: [REDACTED]

To: [REDACTED]

cc:

Subject: Re: AP 3.10Q

FYI: The work plan [REDACTED] has put together as a result of the meeting this week includes model hand-offs (documented using [REDACTED] which will all eventually be QA'd using [REDACTED] (see attachment below). [REDACTED] is going to be the lead on the [REDACTED] the FY98 model. We're not sure how smoothly this is going to go but this is the approach. Like you've said all along, YMP has now reached a point where they need to have certain items work no matter what, and the infiltration maps are on that list. If USGS can't find a way to make it work, Sandia will (but for now they are definitely counting on us to do the job). [REDACTED] totally supports paying for a USGS report on the FY98 model, but they fully realize the problem we're having with the Director's approval thing.

I've had no response from [REDACTED] concerning my response to his request for an FY99 work plan using the close-out funds. [REDACTED] has indicated that I can charge all my time this year to the [REDACTED] account. There was also good indication this week that [REDACTED] is willing to support us in FY00 to continue on with model validation and uncertainty work, and to deal with [REDACTED] addressing the infiltration maps. The [REDACTED] provided to USGS was in direct response to the telecon and was specifically intended for infiltration modeling work. I can no longer wait for USGS to figure this out; I'm moving ahead according to the PA/Sandia work plan we put together this week.

✓ What I really need now are some warm bodies to review the work I've been doing.

Like [REDACTED] said, "Live by the sword, die by the sword!"