UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Atomic Safety and Licensing Board

Before Administrative Judges:

ASLBP BOARD
09-892-HLW-CAB04
Thomas S. Moore, Chairman
Paul S. Ryerson
Richard E. Wardwell

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	**Docket No. 63-001-HLW**
	)	
(High Level Waste Repository)	)	**January 6, 2010**

STATE OF NEVADA REPLY BRIEF ON PHASE I LEGAL ISSUES

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In accordance with the Construction Authorization Board's October 23, 2009 Order, the State of Nevada (Nevada) hereby submits its Reply Brief on Phase I contention legal issues 2-11. Nevada submitted its Opening Brief on these same legal issues on December 7, 2009.

The Department of Energy (DOE) and the NRC Staff (Staff) often make similar arguments in their initial briefs on these issues. To avoid repetition, Nevada is submitting one consolidated Reply Brief that addresses both DOE and Staff arguments.

As explained fully below, nothing in either DOE's or Staff's initial briefs provides any basis for rejecting any of the arguments in Nevada's Opening Brief.

II. Whether 10 C.F.R. § 63.305 requires DOE to project future levels of anthropogenic greenhouse gas emissions such as CO^2 and evaluate the impact of these gases on future climate at Yucca Mountain in the 10,000-year performance assessment, or whether it is sufficient under that regulation for DOE to analyze the effects of anthropogenic greenhouse gas emissions on future climate based upon the historical geologic record.

A. Introduction.

Nevada argued in its Opening Brief that 10 C.F.R. Part 63 grants DOE no legal right to base its projections of future climate states on the historic geologic record. Whether DOE may analyze the effects of anthropogenic greenhouse gas emissions on future climate based solely on the historic geologic record presents a technical issue, not a legal one. DOE argues to the contrary that "NRC intended that prediction of future changes in climate over the next 10,000-year period be based on the geologic record" (DOE Brief on Nevada Safety Contentions 009, 010, 011, 012, 013, and 019 (DOE Issue II Brief) at 2). Staff's position is ambiguous. It seems to agree with DOE when it concludes that "Section 63.305 allows DOE to address the effects of anthropogenic greenhouse gas emissions on repository performance by using climate data in the historical geologic record" (Staff Brief on Phase I Legal Issues (Staff Brief) at 15), but then it seems to agree with Nevada when it concludes that "Section 63.305 does not prescribe factors

relevant to climate change that must be addressed" and "provide[s] flexibility for DOE to determine how to meet the established performance criteria . . . based on reasonable assumptions for the performance assessment such that total dose is not underestimated" (Staff Brief at 12).

B. Argument.

1. DOE argues that 40 C.F.R. § 197.15 requires it to project changes in climate based on the geologic record (DOE Issue II Brief at 3-4). However, there is no such requirement in the EPA regulation DOE cites. Similar to NRC's regulation at 10 C.F.R. § 63.305, EPA's regulation at 40 C.F.R. § 197.15 (as amended in 2008) provides that "DOE must vary factors related to . . . climate based upon cautious, but reasonable assumptions of the changes in these factors that could affect the Yucca Mountain disposal system during the period of geologic stability, consistent with the requirements for performance assessments specified at § 197.36." There is nothing here about using the historic geologic record for anything. Indeed, EPA evidenced its consideration of whether constraints other than "cautious, but reasonable assumptions" would apply to climate change projections when it referenced 40 C.F.R. § 197.36. If EPA had wanted DOE to rely on the historic geologic record in projecting climate changes, it would have said so specifically in 40 C.F.R. § 197.15 or 40 C.F.R. § 197.36, but it did not.

The quote on the bottom of page 3 to the top of page 4 of DOE's Issue II Brief, offered to support the proposition on page 3 that "DOE [is] to project changes in climate specifically based on the geologic record," is not from any EPA regulation, but from the preamble to the 2001 final EPA rule.[1] It is not clear what the quote refers to because the 2001 EPA rule does not, as the quote seems to suggest, specify the use of the geologic record in predicting future climate states. Indeed, EPA never even proposed such a thing, and to include such a requirement in the 2001

[1] The citation in DOE Issue II Brief at 4, n.7, is in error. The correct cite is to 66 Fed. Reg. 32074, 32122 (June 13, 2001).

final rule would have raised serious questions about the adequacy of the EPA rulemaking process. The 1999 proposed EPA rule was substantially similar to the 2001 final rule. It provided that "DOE must vary factors related to . . . climate based on environmentally protective but reasonable scientific predictions of the changes that could affect the Yucca Mountain disposal system over the next 10,000 years." 64 Fed. Reg. 46976, 47014 (Aug. 27, 1999).

In any event, the EPA rule does not apply to this licensing proceeding. It applies only to NRC in the exercise of its rulemaking authority to establish Yucca Mountain licensing standards. *See* section 801(b)(1) of the Energy Policy Act of 1992, 42 U.S.C. § 10141 note ("The Nuclear Regulatory Commission shall, by rule, modify its technical requirements and criteria . . . as necessary, to be consistent with the Administrator's standards promulgated under subsection (a)"). As Nevada's Opening Brief points out (at 2-4), NRC's Yucca Mountain standards in 10 C.F.R. Part 63 include no provision that requires or grants DOE the right to base climate changes on the historic geologic record.

Finally, DOE's use of the National Academy, National Research Council Report "Technical Bases for Yucca Mountain Standards" (NAS Report) is unavailing. While section 801(a)(1) of the Energy Policy Act of 1992, 42 U.S.C. § 10141 note, required EPA to establish Yucca Mountain standards "based upon and consistent with the findings and recommendations of the National Academy of Sciences," the NAS Report made no "finding" or "recommendation" that projections of future climate states must be based on the geologic record. The Academy's "findings" (the NAS Report refers to them as conclusions) and "recommendations" were carefully underlined in the report, to distinguish them from the remainder of the text. The Academy's most relevant "finding" was merely that "physical and geologic processes are sufficiently quantifiable and the related uncertainties sufficiently boundable that the performance

can be assessed over time frames during which the geologic system is relatively stable or varies in a boundable manner" (NAS Report at 9). There is nothing in this finding about use of the historic geologic record. While the discussion on pages 77-78 and 91-92 of the NAS Report suggests that this finding was based, in part, on an assessment of the historic and geologic record, these pages contain no "findings" or "recommendations" and, indeed, seem to have been edited carefully to avoid any use of these terms.

2. DOE argues (DOE Issue II Brief at 4-5) and Staff may be arguing (Staff Brief at 14-15) that 10 C.F.R. § 63.305 makes it sufficient for DOE to make projections of future climate states using only the geologic record. Nevada addressed this legal proposition in its Opening Brief (at 2-5). Neither DOE nor Staff can cite to any regulation language that so provides. Indeed, DOE seems to concede the weakness of its argument when it offers the tepid conclusion that "[n]othing in the plain language of the regulation is inconsistent with DOE's position" (DOE Legal Issue II Brief at 3). The question is not whether the NRC regulation is inconsistent with reliance on the geologic record, or precludes reliance, in part, on the historic geologic record, but whether the regulation requires or grants a right to reliance on the historic geologic record. As Nevada demonstrated in its Opening Brief, it does not.

Rather than using language in an actual regulation, both DOE and Staff quote from the 2001 preamble to 10 C.F.R. Part 63. DOE's selected quote (DOE Issue II Brief at 4, referring to 66 Fed. Reg. 55732 at 55757) suggests that the geologic record provides a "strong basis" for predicting future climate changes. The Commission may have thought this was true in 2001, but the Commission does not say here that the "cautious, but reasonable assumptions" it was requiring in the regulation necessarily meant that the geologic record could provide the *only* basis for projecting climate changes. Staff's quotes (Staff Brief at 12-14, referring to 66 Fed.

Reg. 55732 at 55757 and 55733) are even more problematic. The first citation refers to a discussion of climate in an Issue Resolution Status Report, which reflects only the position of NRC Staff, not the Commission.[2] The second citation refers to a discussion of biosphere pathways. Biosphere pathways are addressed in 10 C.F.R. § 63.305(d), which specifies how radioactive materials coming from the saturated zone below and distant from the repository are presumed to result in a dose to the Reasonably Maximally Exposed Individual or RMEI. This is a matter of health physics and has nothing to do with how future climates may affect the amount of water impinging on the slopes of Yucca Mountain, which is the subject of legal issue II. In fact, Staff's apparent argument here that 10 C.F.R. § 63.305(d) requires future climate states to be consistent with "arid or semi arid conditions" is completely at odds with its position (Staff Brief at 13) that "it is adequate to forecast and bound future hydrologic conditions by studying conditions during past pluvial [rainy] climates."

DOE and Staff both cite to the preamble to the most recent changes to Part 63 (DOE Issue II Brief at 4-5, and Staff Brief at 13). Unfortunately for both, how future climate states should be projected in the 10,000-year performance assessment was beyond the scope of the NRC rulemaking. The NRC neither proposed nor adopted any significant changes to the text of 10 C.F.R. § 63.305 providing that climate factors must vary based on "cautious, but reasonable assumptions of the changes in these factors that could affect the Yucca Mountain disposal system." *See* 70 Fed. Reg. 53313, 53319 (Sept. 8, 2005) (proposed rule) and 74 Fed. Reg. 10811, 10829 (March 13, 2009) (final rule).[3] The 2005 notice of proposed rulemaking formally

[2] Staff also cites its own Yucca Mountain Review Plan, NUREG-1804 (Staff Brief at 14). This also represents the position of Staff, not the Commission.

[3] The proposed rule would have added that the "cautious, but reasonable assumptions" should be "consistent with present knowledge" of the factors that could affect the disposal system. This language is not significant because all assessments are, or should be, based on "present knowledge."

advised Nevada and other interested persons that "NRC requests and will respond to comments only on those provisions of part 63 that we are now proposing to change." 70 Fed. Reg. 53313 at 53315. It would be grossly unfair, and a violation of the notice and comment requirements of 5 U.S.C. § 553 of the Administrative Procedure Act, to construe the new NRC rule as having the legal effect DOE and Staff ascribe to it.

In any event, the DOE quote (referring to 74 Fed. Reg. at 10818) addresses the basis for NRC's choice of deep percolation rates for the post-10,000-year performance assessment. It does not apply to the 10,000-year assessment, which is the subject of this legal issue. The NRC's quote (referring to 74 Fed. Reg. at 10820-23) is offered only to support "Staff's continued intent, as reflected in the rule, for a flexible and pragmatic approach for addressing the speculative area of climate prediction" (Staff Brief at 13). Nevada does not disagree that the NRC rule provides for a "flexible and pragmatic approach" to projecting climate change.

One additional, imaginative, but ultimately bizarre Staff argument remains to be addressed. In 1999, NRC proposed to adopt a version of 10 C.F.R. Part 63 which included a provision (in proposed § 63.115(a)(3)) that "[c]limate evolution shall be consistent with the geologic record of natural climate change in the region surrounding the Yucca Mountain site." *See* 64 Fed. Reg. 8640, 8677 (Feb. 11, 1999). This proposal was completely deleted from the entire final Part 63 rule, with NRC explaining that "[r]equirements related to characteristics of the reference biosphere and critical group [in § 63.115] have been deleted from this section in light of the definitions and concepts necessary to estimate dose to the reasonably maximally exposed individual, now specified in subpart L [which included 10 C.F.R. § 63.305]." 66 Fed. Reg. 55732, 55778 (Nov. 2, 2001). Thus, it is readily apparent that NRC specifically considered whether it should require that projections of climate change be based on the geologic record and

ultimately decided not to do so, preferring instead the more general requirement in 10 C.F.R. § 63.305 that climate projections be based on "cautious but reasonable assumptions. . . ." Yet, Staff draws the opposite conclusion that "no significant change was intended by its removal" (Staff Brief at 14).

In making this argument, Staff strays into the same "Bizarro world" once inhabited by EPA. *See Nuclear Energy Institute v. EPA*, 373 F.3d 1251, 1272 (D.C. Cir. 2004). Just as "based upon" cannot mean "in disregard of" and "consistent with" cannot mean "inconsistent with," deleting a requirement cannot mean that the requirement remains. The only reasonable reading of this regulatory history is that the Commission considered the precise issue being briefed and decided it in Nevada's favor.

3. DOE argues, and Staff suggests, that consideration of human-induced global warming would be inconsistent with 10 C.F.R. § 63.305 because "it would be utterly speculative" (DOE Issue II Brief at 5, Staff Brief at 12). Whether this may be so is a matter of fact and expert opinion, not a matter of law. In any event, it is entirely feasible to project future greenhouse gas emissions based on current utilization of fossil reserves, without assuming any changes in the applicable regulatory regimes. The impact of past and continuing greenhouse gas emissions on global and regional climates is being evaluated by the scientific community by a variety of techniques. The validity of these techniques and the associated impact on climate is a matter of fact and expert opinion.

C. Conclusion.

The plain language of 10 C.F.R. § 63.305, the interplay between 10 C.F.R. § 63.305 and 10 C.F.R. § 63.342(c), and the regulatory history all indicate that DOE has no right to ignore

relevant and up-to-date scientific evidence of global warming and no right to estimate climate changes processes (a subset of FEPs) based solely upon the historical geologic record.

Accordingly, the Board should rule that NEV-SAFETY-009 through 013 and 019 raise fully admissible technical issues, subject only to the resolution of legal issue III/IV, which addresses the consideration of climate in the post-10,000-year Total System Performance Assessment (TSPA) and affects NEV-SAFETY-011 and 019.

III. and IV. Whether 10 C.F.R. § 2.342(c) Requires Climate Change Processes Included as FEPs in the First 10,000 Years To be Carried Forward for the Next 990,000 Years.

A. Introduction.

Nevada argued in its Opening Brief that 10 C.F.R. § 63.342(c) requires climate change and related processes included the 10,000-year performance assessment to be included in the assessment covering the next 990,000 years. Both DOE and Staff argue to the contrary.

B. Argument.

1. As Nevada pointed out in its Opening Brief (at 6-8), 10 C.F.R. § 63.342(c) provides unambiguously as follows: DOE's performance assessments "shall project the continued effects of the features, events and processes included in [the 10,000-year performance assessment] beyond the 10,000-year post-disposal period through the period of geologic stability." To emphasize the point that no feature, events, or process (FEP) included in (or screened in) the 10,000-year performance assessment is excluded from this projection requirement, the first clause of the next sentence states specifically that DOE must evaluate "all" of the 10,000-year FEPs in the post-10,000-year assessment. The next clause of that same sentence then states that FEPs relating to effects of seismic and igneous scenarios, climate change and corrosion must "also" be included in the post-10,000-year assessment.

The essence of DOE's and Staff's argument is that this plain language must be ignored. In effect, DOE and Staff would amend 10 C.F.R. § 63.342(c) by adding "except as provided below" both at the beginning of the subsection and at the beginning of the second sentence and by deleting "and also" at the end of the second sentence.

2. DOE and Staff make no attempt to reconcile their argument with the plain language of the regulation. Instead, they both rely primarily on regulatory history. DOE relies on regulatory history to the effect that the FEPs specified in paragraphs (1)-(3) of 10 C.F.R. § 63.342(c) were added in order to avoid "arbitrary assumptions" and "unbounded speculation" and to "appropriately reflect the uncertainty" (DOE Brief on Nevada-Safety Contention 202 and Post 10,000 Year Aspects of Nevada-Safety Contentions 011 and 019 (DOE Issue III/IV Brief) at 5, 7). Staff argues similarly that the language in paragraphs (1)-(3) of 10 C.F.R. § 63.342(c) "eliminates unresolvable speculation" and addresses a "fundamental uncertainty regarding long-term climate change" (Staff Brief at 16 and 17). But this assumes that speculation and uncertainty about climate change in the post-10,000-year period would always be rampant were it not for the addition of paragraph (2) to 10 C.F.R. § 63.342(c), and that is not the case. DOE included climate change FEPs in its 10,000-year performance assessment, and the opening language of 10 C.F.R. § 63.342(c) merely requires them to be extended through the period of geologic stability. Thus, if paragraph (2) to 10 C.F.R. § 63.342(c) were deleted, 10 C.F.R. § 63.342(c) would still not require DOE to develop entirely new and "speculative" or "uncertain" climate change FEPs for the post-10,000-year performance assessment.

DOE and Staff also point to regulatory history to the effect that the Commission intended that there would be constraints on how climate change processes would be factored into the post-10,000-year performance assessment (DOE Issue III/IV Brief at 5 and 6, n.16, and Staff Brief at

16-18). However, these pieces of regulatory history are only understood properly in light of the precise language of the regulation, which DOE and Staff ignore. Paragraph (2) of 10 C.F.R. § 63.342(c) begins by stating that "DOE must assess the effects of climate change" in the post-10,000-year performance assessment. The paragraph then continues by providing that the post-10,000-year climate change analysis "may" be limited to certain specified effects, that the nature and degree of climate change "may" be represented by constant-in-time climate conditions, and that the climate change analysis "may" commence at 10,000 years after disposal but "shall" extend through the period of geologic stability. The remainder of paragraph (2) then describes the "constant-in-time" climate conditions or values that are "to be used" (the specified deep percolation rates).

It is clear from the text of the regulation that using constant-in-time climate conditions or values is optional because paragraph (2) states specifically that they "may" be used, not that they "must" be used. Indeed, the choice of the word "may" here is clearly no accident. The opening sentence of paragraph (2) uses the word "must" (DOE "must" assess the effects of climate change), implying clearly that NRC knew the difference between "may" and "must" and made its choices intentionally. It is also clear from the text of the regulation that, if DOE does choose to use constant-in-time climate conditions, it may only use the specified deep percolation rate. Here, the regulatory language is mandatory – the specified constant-in-time values are the ones "to be used." The language in the EPA rule, 40 C.F.R. § 197.36(c)(2), is identical in its discriminate use of "must," "may," and "to be used." *See* 73 Fed. Reg. 61256, 61288 (Oct. 15, 2008).

Thus, as the regulatory history suggests, paragraph (2) of 10 C.F.R. § 63.342(c) does indeed impose constraints on how climate change processes are to be factored into the post-

10,000-year performance assessment, just not the ones DOE and Staff have in mind. DOE included climate change FEPs in its 10,000-year assessment, and it is now constrained to project the continued effects of those climate change FEPs through the period of geologic stability. Had DOE not included climate change FEPs in its 10,000-year assessment, it could have used artificial constant-in-time conditions or values to represent climate change processes in its post-10,000-year performance assessment, but if it had so chosen, it would have been constrained to use only the conditions or values specified at the end of paragraph (2).

3. The discussion above also disposes of DOE's and Staff's remaining argument that Nevada's interpretation would result in a "duplicative" or "redundant" treatment of climate change processes in the post-10,000-year performance assessment (DOE Issue III/IV Brief at 7 and Staff Brief at 18-19). DOE is never required to use the specified deep percolation rate in the post-10,000-year performance assessment. Duplicative or redundant treatment will be avoided simply by doing what the regulation requires, namely project the continued effects of climate change processes identified in the 10,000-year performance assessment through the period of geologic stability. Had there been none to project, DOE would have had a choice. It could have developed its own post-10,000-year climate change analysis without constant-in-time values, or it could have used the constant-in-time values developed by NRC, but it would never have been required to use both.

C. Conclusion.

10 C.F.R. § 63.342(c) requires climate change processes included as FEPs in the 10,000-year performance assessment to be carried forward for the next 990,000 years.[4]

[4] On page 2, n.5, of its Issue III/IV Brief, DOE questions whether NEV-SAFETY-009 through 012 address DOE's post-10,000-year climate change analysis. NEV-SAFETY-011 clearly does so because it specifically addresses climate change processes "at about 30,000 years" and "for at least 200,000 to 300,000 years," and the summary argues that "glacial conditions could be deferred by 100,000 years or more." *See* Nevada Petition at 102.

The climate change and related processes identified in NEV-SAFETY-011 and 019 and NEV-SAFETY-202, as applicable to the first 10,000 years, must be included in the next 990,000 years of the TSPA by operation of 10 C.F.R. § 63.342(c). Accordingly, the Board should rule that these contentions all raise fully admissible technical issues.

V. Whether 10 C.F.R. § 63.342(c) requires the post-10,000-year performance assessment to include the continued effects of erosion if, assuming for purposes of legal argument, in the 10,000-year assessment erosion is shown to increase infiltration and seepage rates and thereby be potentially adverse to performance, with that potential increasing over time both before and after 10,000 years, but there is no showing that erosion causes increases in radiological exposures or releases within the first 10,000 years.

A. Introduction.

In its Opening Brief, Nevada argued that land surface erosion must be considered in the 10,000-year performance assessment if it will increase infiltration and seepage rates and thereby be potentially adverse to performance, with that potential increasing over time both before and after 10,000 years, even if erosion is not shown to actually increase radiological exposures or releases within the first 10,000 years. This issue is important because a negative answer could lead to the licensing of a repository under 10 C.F.R. Part 63 without any consideration of whether continued erosion after 10,000 years will expose tens of thousands of metric tons of high-level radioactive waste directly to the environment, probably the worst imaginable safety outcome.[5] DOE and Staff both argue that land surface erosion can be ignored, regardless of its potential to produce large radiological doses and releases after 10,000 years, if it does not happen to result in increased doses and releases before then.

[5] The rule waiver requested in NEV-SAFEY-203 would avoid this manifestly unsafe outcome.

B. Argument.

1. Nevada's Opening Brief focused on 10 C.F.R. § 63.102(j), which states that "[t]he performance assessment is a systematic analysis that [among other things] identifies the features, events and processes . . . that might affect performance of the geologic repository," and that "[t]hose features, events and processes expected to materially affect compliance with § 63.113(b) *or* be potentially adverse to performance *are included*. . . ." (Emphasis added). Nevada stressed the significance of the word "or." A FEP (such as land surface erosion) must be considered if it is expected to materially affect compliance with the dose standard referred to in 10 C.F.R. § 63.113(b), *or* if it is expected to be "potentially adverse to performance," as would be the case if it changed intermediate-performance measures (infiltration and seepage rates) that can be linked to radiological exposure or radionuclide release. Indeed, 10 C.F.R. § 63.102(j) implies what is meant by "potentially adverse to performance" by offering "potentially adverse effects of fracture flow" and "criticality event" as examples. "Potentially adverse effects on fracture flow" is an intermediate performance measure closely akin to infiltration and seepage.

DOE and Staff ignore 10 C.F.R. § 63.102(j). Instead, DOE relies on 10 C.F.R. §§ 63.2, 63.113, 63.114, and 63.342(a), and Staff focuses just on 10 C.F.R. § 63.342(a) and (c)(2) (DOE Brief on Contention NEV-SAFETY-041 (DOE Issue V Brief) at 3-7 and Staff Brief at 19-22). Nevada will first address 10 C.F.R. § 63.114. It provides that FEPs "must be evaluated in detail if the magnitude and time of the resulting radiological exposures to the [RMEI], or radionuclide releases to the assessable environment, for 10,000 years after disposal, would be significantly changed by their omission." However, specifying certain FEPs that "must" be evaluated is not inconsistent with requiring other FEPs to be evaluated as well. Moreover, under DOE's reading, no FEP would be included unless both the magnitude *and* the time of exposures or releases

would be significantly changed. This would require the exclusion of a FEP that increased peak doses or releases within 10,000 years to lethal levels, but did not change the time within 10,000 years when the peak dose or release occurred, an obviously absurd and unsafe result. 10 C.F.R. § 63.114 must allow for the possibility that other FEPs would need to be evaluated.

10 C.F.R. § 63.342(a) is cited by both DOE and Staff. It provides that DOE need not evaluate the impacts resulting from any process "if the results of the performance assessments would not be changed significantly in the initial 10,000-year period after disposal." DOE argues that "the results" are limited to the ultimate results of the assessment, i.e., radiological doses or releases (DOE Issue V Brief at 3-5). Staff merely assumes this is how the regulation must be read (Staff Brief at 20-21). However, this is not the only permissible reading of 10 C.F.R. § 63.342(a). DOE relies here on 10 C.F.R. §§ 63.2 and 63.113 (DOE Issue V Brief at 4-5). 10 C.F.R. § 63.2 defines "performance assessment" as an analysis that produces several products besides a release or dose calculation, and in a way that does not use the words "result" or "results." 10 C.F.R. § 63.2 offers no compelling definition of the term "results" as that term appears in 10 C.F.R. § 63.342(a). 10 C.F.R. § 63.113 also does not define "results," but merely specifies what must be, in effect, the *ultimate* purpose or result of a performance assessment.

DOE and Staff ignore another definition of "performance assessment" in 10 C.F.R. § 63.102(j). This definition provides for the identification of FEPs that "might affect" performance and requires both an examination of their "effects on performance" *and* an estimate of "radiological exposure," suggesting if anything that "effects," and then possibly "results," may mean something other than just estimates of "radiological exposure."

Clearly, the term "results" can mean any effect on performance, including an effect on an intermediate performance measure that might affect doses or releases. Moreover, DOE's and

Staff's argument presumes that the "results" of a performance assessment will be available when FEPs are first selected. But if results mean calculated doses or releases, there will be no performance assessment capable of producing such "results" unless the "events" and "processes" have already been selected. Thus, DOE and Staff put themselves into a "catch-22" situation whereby FEPs cannot be selected without knowing "results," but "results" cannot be known without first selecting FEPs.

As Staff points out, the language in 10 C.F.R. Part 63 must be construed to give effect to all provisions (Staff Brief at 18, citing to *Hydro Resources, Inc. (P.O. Box 777, Crown Point, New Mexico 87313)*, 63 NRC 483, 491 (2006)). If we construe the regulations cited by DOE and Staff to require that FEPs be excluded if it is not shown that their inclusion would result in a significant change in radiological releases or doses, the provision in 10 C.F.R. § 63.102(j) requiring the inclusion of FEPs that either materially affect compliance with the dose standard *or* are "potentially adverse to performance" is given no effect. The regulations cited by DOE, Staff, and Nevada are harmonized only by adopting Nevada's interpretation of them.

2. DOE argues that EPA requires NRC to exclude FEPs from the performance assessment unless they significantly affect dose (DOE Issue V Brief at 5-7). DOE does not (and cannot) cite to an EPA rule that actually says this. In fact, the EPA rule (40 C.F.R. § 197.36(a) provides that, "*unless otherwise specified in . . . NRC regulations,*" DOE's 10,000-year performance assessments need not include an evaluation of the impacts of FEPs "if the results of the performance assessments would not be changed significantly. . . . " (emphasis added). Therefore, regardless of what EPA meant here by its use of the term "results," the NRC's regulations are controlling, not EPA's. As argued above, NRC's rules provide for the inclusion of a FEP if it is expected to materially affect compliance with the dose standard *or* if it is

expected to be "potentially adverse to performance," as would be the case if it changed intermediate-performance measures (infiltration and seepage rates) that can be linked to later radiological exposure or radionuclide release.

DOE also offers selected quotes from the regulatory history of the 2008 EPA rulemaking to support its interpretation of the NRC's rules (DOE Issue Brief V at 6). However, one agency's interpretation of another agency's rule is entitled to no deference whatsoever. *See U.S. Department of the Air Force v. FLRA*, 952 F.2d 446, 450 (D.C. Cir. 1991).

3. Staff argues that Nevada's position must be rejected as inconsistent with the specification of deep percolation rates in 10 C.F.R. § 63.342(c)(2) (Staff Brief at 20, 21-23). There are several problems with Staff's argument. First, as argued under Issue III/IV above, 10 C.F.R. § 63.342(c)(2) does not always require the use of the deep percolation rate or necessarily confine the effects of climate change to increased water flow though the repository. Second, as Nevada's July 3, 2009 Reply to NRC Staff's Answer to NEV-SAFETY-202 and 203 makes clear (at 14-15), there is not a shred of evidence in the recent rulemaking that the Commission actually considered land surface erosion when it promulgated its deep percolation rates.

4. Finally, if we construe and apply the regulations in 10 C.F.R. Part 63 as DOE and Staff argue, a potentially grave safety problem might be ignored unless the rule in 10 C.F.R. § 63.342(c) is waived. A repository may be licensed under 10 C.F.R. Part 63 without any consideration of whether continued erosion after 10,000 years will expose tens of thousands of metric tons of high-level radioactive waste directly to the environment, probably the worst imaginable safety outcome. This violates a cardinal rule of interpretation of NRC regulations. "We must construe and apply our regulations in a manner that is in accord with public health and

safety and general administrative law principles." *Public Service Company of New Hampshire (Seabrook Nuclear Power Station, Units 1 and 2)*, CLI-88-10, 28 NRC 573, 596 (1988).

C. Conclusion.

If erosion is shown to increase infiltration and seepage rates (i.e., intermediate-performance measures that can be linked to radiological exposure or radionuclide release), and thereby be potentially adverse to performance within 10,000 years, erosion cannot be screened out of the 10,000-year assessment, and it must be included in the post-10,000-year assessment by operation of 10 C.F.R. § 63.342(c). A contrary conclusion might lead NRC to ignore a grave safety problem with Yucca Mountain.

Accordingly, the Board should rule that NEV-SAFETY-041 raises a fully admissible technical issue for the post-10,000 TSPA even if it is not shown that land surface erosion will increase dose and releases within 10,000 years.

VI. Whether, under 10 C.F.R. Part 63, DOE is required to provide and rely upon final design information in the LA.

A. Introduction.

DOE's license application relies on preliminary or conceptual design information, even with respect to repository features that are important to safety or waste isolation and are without regulatory precedent, where it would be expected that the development of the final design will pose significant technical challenges that could lead to fundamental design changes. Nevada argued in its Opening Brief that this level of information is insufficient and that final design information must be provided. The adjective "final" refers to that level of design information typically found in a Final Safety Analysis Report submitted under 10 C.F.R. Part 50 and does not mean that the information may never be changed. DOE and Staff disagree that final design information is required at the construction stage.

B. Argument.

1. DOE argues that the plain language of the application requirements in 10 C.F.R. § 63.21 does not require submission of final design information (DOE Brief on Consolidated Contentions NEV-SAFETY-146/NEV-SAFETY-201 (DOE Issue VI Brief) at 3-5). DOE first argues that 10 C.F.R. § 63.21(c)(1) implies that the submitted design information need not be final. This regulation requires DOE to describe the site with "appropriate attention to those features, events, and processes of the site that might affect design." However, this provision addresses requirements for site information, not design information. Requiring site information that "might affect" design merely reflects the NRC's desire to review a full suite of site information that might have a bearing on the safety of DOE's proposed design. The word "might" is used to preclude a possible DOE argument that site information may be omitted if it might appear initially to affect design safety but, after elaborate analyses, does not actually do so. NRC wants to review site information that "might" affect design so that it can be sure any such DOE analyses are correct. Therefore, the phrase "might affect design" does not imply anything about what level of design information must be included in the application. It does perhaps imply that the design may need to be changed, but this just recognizes that NRC may require design changes as a result of its construction authorization safety review and has nothing to do with design completeness.

It is noteworthy in this regard to point out that when (and if) the time comes for DOE to update its application prior to receiving waste, the applicable NRC regulation (10 C.F.R. § 63.24) does not specifically require DOE to review the compatibility of the site with the final design. This is a noteworthy omission. NRC must have thought such an analysis would be unnecessary because all issues bearing on the compatibility of site and final design would have

been resolved with finality at the construction authorization stage. This would be impossible if DOE provided only preliminary or conceptual design information at this stage.

Next, DOE refers to 10 C.F.R. § 63.21(c)(18), which requires that special attention be given to items "that may significantly influence the final design." But as was the case with 10 C.F.R. § 63.21(c)(1), this just indicates that DOE should be expansive in its analyses and justification of items having a possible bearing on design safety. Indeed, the most reasonable reading of 10 C.F.R. § 63.21(c)(18) cuts against DOE. DOE could not logically devote special attention to items "that may significantly influence the final design" if no final design information is available. It is true that the adjective "final" does not appear before the noun "design" elsewhere in 10 C.F.R. § 63.21, but the adjective "preliminary" DOE prefers also does not appear before "design" anywhere in this regulation.

DOE then points to 10 C.F.R. § 63.21(c)(3), which requires that the application include "[a] description and discussion of the design . . . including (i) [d]imensions, material properties, specifications, analytical and design methods used along with any applicable codes and standards; (ii) [t]he design criteria used and their relationship to the preclosure and postclosure performance objectives . . . and (iii) [t]he design bases and their relation to the design criteria." As DOE points out, the word "final" does not appear. However, final design information would include "dimensions" and "specifications." The contrast with 10 C.F.R. § 50.34(a)(3) is telling. 10 C.F.R. § 50.34(a)(3) describes what the "preliminary design" for a nuclear facility includes. It does not include "dimensions" or "specifications" but only "general arrangement, and approximate dimensions."

Finally, DOE argues that 10 C.F.R. § 63.21(a) excuses it from supplying any final design information because such information was "not reasonably available at the time of docketing."

Nevada addressed this provision in its Opening Brief (at 17-18, 20). DOE's reading would eviscerate all of the information requirements in 10 C.F.R. Part 63 and is contrary to the regulatory history. DOE unilaterally chose when to file its license application. It could have filed at a later time, when additional design (and other) information was available. If DOE's argument were to be accepted, it's strategic choice of an early application filing date would bind NRC's hands in any subsequent regulatory decision with respect to the level of design (and other) information that must be included in the license application. NRC cannot have intended such a result.

2. Nevada relies primarily, but not exclusively, on the overall structure and extensive regulatory history of 10 C.F.R. Part 63 (Nevada Opening Brief at 12-20). DOE's effort along these lines pales in comparison (DOE Issue VI Brief at 5-7). It relies on a Commission discussion of the multi-staged licensing process in the preamble to the original 10 C.F.R. Part 63. 66 Fed. Reg. 55732, 55738-39 (Nov. 2, 2001). This language merely suggests that the Commission will make multi-staged licensing decisions in a logical sequence, based on a single application, that more information will be available at the later licensing stages, that the regulations provide flexibility for making decisions "consistent with the amount and level of detail of information appropriate to each licensing stage," and that while the application must be as complete as possible in light of reasonably available information, "at each stage, DOE must provide sufficient information to support that stage." Nowhere here does the Commission suggest that the "amount and level of detail of information appropriate to [the construction authorization] licensing stage" consists of preliminary design information only or suggest in any other way that preliminary design information will be sufficient at construction authorization stage.

3. DOE argues that not requiring final design information at the construction authorization stage would be consistent with Commission practice (DOE Issue VI Brief at 7-10). DOE's discussion of the licensing of plutonium fuel fabrication facilities under 10 C.F.R. Part 70 is irrelevant, as there is no indication that the practice in licensing such facilities played any role in developing 10 C.F.R. Part 63.

DOE's discussion of Commission practice in licensing nuclear power plants under 10 C.F.R. Parts 50 and 52 is relevant, but any comparison of Part 52 to Part 63 favors Nevada, not DOE, for the reasons given in Nevada's Opening Brief (at 14-20). As Nevada explained, the regulatory history confirms that Parts 60 and 63 were deliberate departures from Part 50 and were intended to be more like Part 52. Parts 52, 60, and 63 all embodied a staged approach to licensing of construction and operation that involved only one application. The design of structures, systems, and components that are important to safety (Part 52) or safety and waste isolation (Parts 60 and 63) would be fully reviewed and approved at the combined license or construction authorization stage, and preliminary design information alone would not support the issuance of a combined license or a construction authorization.

Only one additional DOE argument here warrants further discussion. Nevada analogized the construction authorization stage in 10 C.F.R. Part 63 to the combined license stage in 10 C.F.R. Part 52 (Nevada Opening Brief at 18-19). DOE argues that final design information is not required at the combined license stage and suggests that the Commission could not have intended that an applicant for a construction authorization would be subject to a more stringent requirement. DOE's argument rests on a flawed premise. 10 C.F.R. § 52.79(a) provides that a combined license application must include "information sufficient to enable the Commission to reach a final conclusion on all safety matters that must be resolved by the Commission before

issuance of a combined license," including "information relative to materials of construction, arrangement, and dimensions, sufficient to provide reasonable assurance that the design will conform to the design bases with adequate margin for safety." This level of design information is not characterized as general, approximate, preliminary, or non-final in any way, as is appropriate for a licensing stage that calls for a final conclusion on safety matters. Perhaps because Staff is aware of the high level of design detail required in a combined license application, its Brief (at 26-27) goes in a direction opposite to that of DOE. Instead of arguing, like DOE, that the construction authorization stage in Part 63 and the combined license stage in Part 52 are similar, Staff is forced to argue that they are entirely different.

4. Much of Staff's Brief is devoted to a general discussion of how 10 C.F.R. Part 63 is a "performance-based" and "risk-informed regulation" that provides for a "multi-staged licensing process" (Staff Brief at 24-31). "Performance-based," "risk-informed" and "multi-staged" are not precise concepts, and Staff does not explain why a "performance-based" and "risk-informed regulation" providing for a "multi-staged licensing process" is in any way inconsistent with a requirement that final design information be provided before construction is authorized.

Staff cites to the preamble of the original 10 C.F.R. Part 63, referring specifically to the same discussion relied upon by DOE (Staff Brief at 24, 30, referring to 66 Fed. Reg. 55732 at 55738-39). As indicated above, nowhere here does the Commission suggest that the amount and level of detail of information appropriate to the construction authorization stage consists of preliminary design information only or suggest in any other way that preliminary design information will be sufficient at the construction authorization stage.

The Commission's discussion of the preclosure safety analysis report (Staff Brief at 28-29, referring to 66 Fed. Reg. 55732 at 55743) offers no relevant information. This discussion does not address flexibility in the amount of design detail that must be provided, but flexibility in the amount of detail required to address each topic in the ISA(PSA), which is a probabilistic safety assessment entailing the identification and analysis of event sequences (*see* 10 C.F.R. § 63.102(j)). Staff's discussion of its Yucca Mountain Review Plan, Interim Staff Guidance, and Risk Insights Baseline Report (Staff Brief at 28-29) is also irrelevant because these reflect only the views of Staff, not the Commission.

Staff discusses the differences and similarities among 10 C.F.R. Parts 50, 52, and 63 (Staff Brief at 26-27). Its conclusion, that final design information is never required at the earlier stages of a multi-stage licensing process, is incomprehensible. All three regulatory regimes have multiple stages – construction permits followed by operating licenses (Part 50), combined licenses followed by findings before operating that acceptance criteria are met (Part 52), and a construction authorization followed by a license to receive and possess wastes (Part 63). If Staff were correct, the level of final design information typically found in a Final Safety Analysis Report under Part 50 could not be required under Part 52, but Staff opines elsewhere (Brief at 27) that this is not the case. The essential problem with Staff's argument, apart from its internal inconsistency, is that characterizing a licensing process as a multi-staged one proves nothing about the level of design information required at various stages.

Staff also discusses 10 C.F.R. § 63.24(b) in some detail (Staff Brief at 25-26). Staff explains how this regulation reserves several matters for review at the receipt and possession licensing stage, but fails to acknowledge the most important point, which is that the regulation does not require DOE to provide final design information and a final safety analysis report prior

to the receipt and possession of waste because these would already have been provided at the construction authorization stage.

Finally, Staff discusses the regulatory history of 10 C.F.R. Part 60 (Staff Brief at 29-30). It concludes that Nevada misreads that history, but does not explain why this is so.

C. Conclusion.

10 C.F.R. Part 63 requires that the design of structures, systems, and components important to safety or waste isolation be fully reviewed and approved at the construction authorization stage, and preliminary design information alone cannot support the issuance of a construction authorization. This is especially true with respect to those repository items that are important to safety or waste isolation and are without regulatory precedent.

Accordingly, the Board should decide NEV-SAFETY-146/201 in favor of Nevada.

VII. Whether, under 10 C.F.R. § 63.114, DOE may rely upon its quality assurance program and procedures as a basis for excluding from consideration in the TSPA, potential deviations from repository design or errors in waste emplacement.

A. Introduction.

NEV-SAFETY-149 addresses the possibility that the circumstances of the as-built repository and the as-emplaced wastes will deviate from what was authorized and intended because of human error. Nevada argued in its Opening Brief that such errors must be screened in (or out) using the same frequency or consequence screening criteria that apply to other FEPs, instead of being screened out on purely legal grounds, with no technical analysis of probability or effects.

It appeared from a document supporting its application that DOE ultimately screened these error events out on the basis of low consequence, but DOE's short and entirely qualitative discussion there of how its quality assurance (QA) program will be implemented suggested to Nevada that DOE was actually making a legal argument, not a technical one. Specifically, DOE

seemed to be saying that its implementation of a compliant QA program leads as a matter of law to the conclusion that human errors will be detected and corrected in such a successful manner that they may all be screened out based on low consequence. *See* DEN001593379, referred to in Nevada's Reply to DOE's Answer to Nevada's Petition to Intervene, at 653-54.

That is precisely what DOE argues here. In its Brief on NEVADA-SAFETY Contention 149 (DOE Issue VII Brief), DOE argues not only that "the Commission must have intended that DOE would *take into consideration* QA program effectiveness in its screening of FEPs" (DOE Issue VII Brief at 4), but also that "DOE may *rely* on the expected effectiveness of the QA program and procedures to exclude from consideration in the TSPA potential deviations from repository design or in waste emplacement" (at 6, emphasis added). Clearly, DOE does not intend to do any quantitative analysis of human errors and their possible consequences to support its case.

Staff agrees with Nevada on this issue. Although it urges the Licensing Board to answer the question in the affirmative (Staff Brief at 31), its actual position is that "DOE's quality assurance program *could* constitute an appropriate *technical basis* for excluding FEP 1.1.03.01.0A. Whether that reliance is adequate is a determination that will be made in the SER" (Staff Brief at 33) (emphasis added). Nevada agrees that nothing in 10 C.F.R. Part 63 prevents DOE from attempting to make this *technical* case, presumably using quantitative analyses of human errors.[6]

[6] No aspect of NEV-SAFETY-149 is moot, contrary to DOE's conclusion on page 3, n.6, of its Issue VII Brief. Nevada's Petition to Intervene challenged DOE's screening decision on legal grounds (Petition at 783), but when DOE ostensibly switched its screening basis from "regulation" to "low consequence," Nevada in its Reply (at 653-54) challenged the technical sufficiency of DOE's claim, although it suspected (for good reason) that DOE's screening decision was still purely legal.

B. Argument.

Much of DOE's Brief goes to establish the proposition that nothing in 10 C.F.R. Part 63 requires DOE to ignore its QA program and procedures in making FEP screening decisions and that DOE's QA program and procedures must be taken into account in making FEP screening decisions (DOE Issue VII Brief at 3-4). Nevada does not disagree. However, beginning at the bottom of page 4, DOE argues in addition that it may *rely* on the expected effectiveness of the QA program and procedures to screen out potential deviations from repository design or in waste emplacement arising from human errors.

DOE's argument is based primarily on 10 C.F.R. § 63.142(q), which provides in effect that potential deviations from design must be evaluated for potential impact and that significant deviations detected during the operational period must be corrected. Elsewhere, Nevada argues that there is not reasonable assurance DOE is capable of implementing a compliant QA program. *See* NEV-SAFETY-003. But for present purposes, let us assume DOE is able to, and does, implement a compliant QA program. However, DOE and DOE contractor personnel are not superhuman, incapable of any human errors. It is possible that some errors will be made, despite sufficient resources and best intentions. Therefore, the pertinent question is whether, as a *legal* matter, DOE is entitled to ignore this possibility.

As Nevada argued in its Opening Brief (at 22-25), there is nothing in 10 C.F.R. Part 63, especially the provisions regarding FEP screening, that grants an entitlement or right to DOE to ignore the possibility of human error in screening FEPs. The preamble to the original Part 63 cited by DOE (DOE Issue VII Brief at 5, n.13, referring to 66 Fed. Reg. 55732 at 55746) does not suggest that any such entitlement or right is being granted. It merely provides that NRC will rely on a number of factors, including but not limited to DOE's QA Program, in deciding

whether post-closure performance objectives are satisfied. If DOE were correct, the Commission would have said here that DOE's QA program was all that would be relied upon. The cases cited by DOE in footnote 13 of page 5 also do not help DOE's case. The cited finding in *Carolina Power & Light Company* was a factual one, entirely dependent on factual affidavits provided as evidence in that particular case. DOE offers no affidavits or other evidence here, preferring that the matter be resolved as a purely legal matter. The cited statement of issue in *Braidwood* suggests only that quality assurance is relevant to safety. We agree.

C. Conclusion.

Deviations from the repository design or errors in waste emplacement caused by human error must be screened in (or out) using the same frequency or consequence screening criteria that apply to other FEPs, instead of being screened out on purely legal grounds, with no technical analysis of probability or effects. They may not be excluded just because DOE will have a compliant and functioning quality assurance program.

Accordingly, the Board should decide NEV-SAFETY-149 in favor of Nevada.

VIII. Whether, under NWPA § 121(b)(1)(B) or 10 C.F.R. §§ 63.113(a) through (d) and 63.115(a) through (c), DOE is required to evaluate the absence or failure of all drip shields.

A. Introduction.

There is no issue here whether, in evaluating DOE's license application, the NRC should presume that DOE will renege on its promise to install drip shields. The issue here is whether DOE must evaluate the postulated absence or failure of all drip shields in order to ascertain their contribution to total system performance and thereby determine whether the multiple barrier and defense-in-depth requirements of section 121(b)(1)(B) of the Nuclear Waste Policy Act, 42 U.S.C. § 10221 and 10 C.F.R. Part 63 are satisfied. In its Opening Brief, Nevada argued that

such an evaluation (called a neutralization analysis) is required. DOE and Staff argue that no such evaluation is required.

B. Argument.

1. DOE argues that the "absence" of drip shields need not be evaluated because this proceeding is no place to question whether DOE will implement its commitment to install drip shields and because this would require DOE to evaluate an alternative design in violation of Part 63 (DOE Brief on Contention NEV-SAFETY-161 (DOE Issue VIII Brief) at 3-5). This argument is completely irrelevant. As indicated above, and in Nevada's Opening Brief (at 25), the issue here is not whether the drip shields will in fact be installed, or whether DOE should adopt an alternative design, but whether the absence of drip shields must be postulated in a neutralization analysis to determine whether DOE's safety case relies wholly or unduly on a single barrier in violation of the multiple barrier and defense-in-depth requirements in 10 C.F.R. Part 63.

2. DOE asserts that "[t]here is no regulatory requirement for DOE to assume and then to analyze the complete failure of any Barrier . . . in the absence of a finding that such a failure is within the bounds of probability or consequence that must be analyzed in the performance assessment" (DOE Issue VIII Brief at 5). DOE supports this assertion by referring to 10 C.F.R. § 63.342. Absolutely nothing in this regulation supports DOE's assertion. This regulation addresses FEP screening. NEV-SAFETY-161 does not allege that the absence or failure of all drip shields is a FEP that must be screened into the performance assessment. The legal issue being briefed concerns multiple barriers and defense-in-depth, not FEP screening.

3. DOE states that it "did in fact, analyze complete failure of the drip shields in the context of certain circumstances" (DOE Issue VIII Brief at 5). As DOE's subsequent discussion

makes clear, DOE did *not* in fact analyze the consequences of a failure of all drip shields in its application, but instead analyzed whether specific FEPs could result in such failure and concluded that they could not.

4. Staff's Brief begins with a discussion of Nevada's failure in the original Part 63 rulemaking to convince the Commission that the regulation should include predetermined, performance requirements on individual barriers (Staff Brief at 34). While it is true that the Commission rejected Nevada's approach, the Commission nevertheless required that the repository system reflect the philosophy of defense-in-depth. To that end, the Commission required the repository system DOE selected to be resilient and robust and mandated that repository safety cannot be wholly or unduly dependent on a single barrier (Nevada's Opening Brief at 27-31). Indeed, Staff concedes (Staff Brief at 35) that the repository system cannot be "wholly dependent on a single barrier" (Staff Brief at 35). Nevada does not argue that Part 63 should be something other than what it is, but simply takes the Commission at its word.

While Staff argues that "the absence or failure of any one element of the engineered barrier system, considered in isolation from the other elements of the system is not controlling" (Staff Brief at 34), the neutralization analysis Nevada believes is required does not evaluate the absence or failure of drip shields "in isolation from the other elements of the system," but rather evaluates how all of the other elements of the system would perform without the drip shields. While Staff asserts that there is no requirement to evaluate the absence or failure of all drip shields, it completely fails to explain how it would otherwise evaluate and make sure that repository safety is not wholly or unduly dependent on a single barrier.

5. Staff continues with a discussion of *Nuclear Energy Institute v. EPA*, 371 F.3d. 1251 (D.C. Cir. 2004) (Staff Brief at 34-35). Nevada does not argue that Part 63 should be

something other than what it is. It accepts the holding in *Nuclear Energy Institute v. EPA* that the multiple barrier requirement in section 121(b)(1)(B) of the Nuclear Waste Policy Act does not require NRC to establish predetermined performance requirements or quantitative limits on individual barriers. But as indicated above and in Nevada's Opening Brief, 10 C.F.R. Part 63 *as written* requires that the repository system reflect the philosophy of defense-in-depth, requires a safety emphasis on ensuring the repository system is resilient and robust, provides that repository safety cannot be wholly or unduly dependent on a single barrier, and contemplates that a barrier neutralization analysis would be performed to determine whether these requirements are met. This is not the same as establishing predetermined, performance requirements or quantitative limits on individual barriers, and then demanding that DOE comply regardless of how the overall system performs, but rather about whether the repository system as a whole, given DOE's free choice of engineered barriers, lacks resiliency and defense-in-depth. Whether DOE's license application is compliant with Part 63 was not before the Court in *Nuclear Energy Institute v. EPA,* and nothing in that decision addresses this question.

6. Staff concludes with an argument that "Nevada's position contravenes the express language of 10 C.F.R. § 63.115, 'Requirements for multiple barriers'" (Staff Brief at 35-36), but Staff utterly fails to explain why this is the case.

C. Conclusion.

The regulations in 10 C.F.R. §§ 63.102(h), 113(a)-(d), and 115(a)-(c) must be construed in accordance with their regulatory history emphasizing the importance of defense-in-depth and resilience. Repository safety cannot be wholly or unduly dependent on a single barrier, and assuring this requires an evaluation in which a barrier (the drip shields) is neutralized and a

determination made of the difference in result from the base case (all drip shields installed and effective, just as planned).

As Nevada noted in its Opening Brief, resolution of this legal issue will not completely address NEV-SAFETY-161. If Nevada prevails on the legal issue, the drip shield neutralization analysis will have to be performed. If Nevada does not prevail on the legal issue, the question will remain whether a neutralization analysis should be required of DOE as a policy or technical matter, because this would be the most appropriate way to determine compliance with the requirement for multiple barriers and defense-in-depth. And even if DOE performs no neutralization analysis, the question will remain whether DOE violates the requirements for multiple barriers and defense-in-depth because post-closure safety relies unduly on the drip shield, although it would be unclear, at best, how this question would be answered.

IX. Whether 10 C.F.R. §§ 63.21(c)(7) and 63.31 allow DOE to submit in the LA a description of its retrieval plans without having a full retrieval plan available for review.

A. Introduction.

10 C.F.R. § 63.21(c)(7) requires that the application include a "description" of plans for retrieval and alternate storage of the radioactive wastes. Nevada argued in its Opening Brief that this regulation must be read to require that the retrieval plans already exist. Both DOE and Staff disagree.[7]

[7] Staff's "Yucca Mountain Review Plan, Revision 2," NUREG -1804 (Review Plan), indicates that Staff will be reviewing DOE's retrieval "plans," not DOE's "description" of those plans, and it articulates the specific component details of the **plan** which Staff must scrutinize for their acceptability and completeness. *See* Review Plan, section 2.1.2 at 82 to 85. This contrasts with other parts of the Review Plan, which indicate Staff will be reviewing a "description" of a plan, not a plan itself. *See* Review Plan, section 1.3 at 1-7 to 1-8 (review of physical protection plan description). The Review Plan is not binding on any party or the Licensing Board. Nevertheless, Staff's litigating position appears to be at odds with its own Review Plan, which is especially curious because the Review Plan plays a prominent role in Staff's argument on some other issues.

B. Argument.

1. DOE and Staff argue that the regulation on its face does not require an actual retrieval plan to exist at the construction authorization stage. According to them, only a description of a plan is required at this review stage (DOE Brief on Contention NEV-SAFETY-169 (DOE Issue IX Brief) at 2 and Staff Brief at 36-37). But as Nevada explained, the most natural reading of the regulation is that a plan (such as a retrieval plan) must actually exist in order for it to be described (Nevada Opening Brief at 32-33).

2. DOE argues that an actual retrieval plan should not be required because an actual physical protection plan is not required (DOE Issue IX Brief at 2-3). However, as Nevada explained in its Opening Brief, requiring an application to include a description of a plan may or may not mean that the plan must actually exist (Nevada Opening Brief at 32). The fact that NRC sees no need for an actual physical security plan to exist at the construction authorization stage does not compel the same conclusion for other plans.

3. DOE argues that the regulatory history indicates that certain categories of information, specifically including retrieval plans, need not be available at the construction authorization stage (DOE Issue IX Brief at 3, citing 46 Fed. Reg. 13971, 13974 (Feb. 25, 1981). In the part of the preamble to the original 10 C.F.R. Part 60 final rule quoted by DOE, the Commission refuses to clarify further whether emergency and retrieval plans must be available in full detail at the construction authorization stage, explaining that clarification is already given in 10 C.F.R. § 60.24(a) and (in a part not quoted by DOE) 10 C.F.R. § 60.24(b). The former regulation is discussed in Nevada's Opening Brief (at 17-18, 20). As explained therein, DOE's reading of 10 C.F.R. § 60.24(a) would eviscerate all of the information requirements in 10 C.F.R. Part 63 and be contrary to the regulatory history.

DOE's omission of the Commission's quote explaining the relevance of 10 C.F.R. § 60.24(b) is telling. This regulation, like 10 C.F.R. § 63.24(b), specifies what particular categories of information must be submitted at the receipt and possession stage. The Commission explains that the particular categories of information listed here "where appropriate, may be left for consideration only at the state of license issuance." The categories of information do not include anything about retrieval plans. The clear implication is that it would not be appropriate for retrieval plans to be left for consideration only at the license issuance (receipt and possession) review stage.

4. DOE contrasts 10 C.F.R. § 63.21(c)(7) with (among other regulations) 10 C.F.R. § 63.21(c)(22) and Staff contrasts 10 C.F.R. § 63.21(c)(7) with "other [unspecified] subsections within § 63.21." DOE and Staff argue that these contrasts prove that NRC recognizes the difference between "plans" and "descriptions of plans" and its word choices should be presumed deliberate (DOE Issue IX Brief at 4 and Staff Brief at 39-40). One would wish this were true. In its Opening Brief (at 33), Nevada cited regulatory history indicating an express Commission understanding that actual retrieval plans would need to be reviewed at the construction authorization stage, although the application itself may only include a "description of them" (*see* 66 Fed. Reg. 55732, 55743 (Nov. 2, 2001)). Furthermore, 10 C.F.R. § 63.21(c)(21) requires the application to include a "description" of emergency plans, implying (according to DOE) a deliberate choice of a "description" of an emergency plan as opposed to an actual plan. But that is not true, because 10 C.F.R. § 63.31(a)(3)(v) requires that an emergency plan actually exist. It requires a specific finding before issuance of a construction authorization that "DOE's emergency *plan* complies with the criteria contained in subpart I of this part" (emphasis added).

5. Finally, DOE argues that an actual retrieval plan need not exist because 10 C.F.R. § 63.111(e) requires a finding that "the repository operations area be designed to preserve the option of waste retrieval" (DOE Issue IX Brief at 5). However, there is no inconsistency here. The preferred method for determining whether the repository design preserves the option of retrieval would be to review an actual retrieval plan for its consistency with the repository design.

6. Staff argues that an actual retrieval plan is not needed because the Commission can find "reasonable assurance" without one and can impose a license condition requiring one to be developed later (Staff Brief at 36). However, Staff does not explain why this is so. If, as Nevada argues, an actual retrieval plan must exist at the construction authorization stage, it would follow that there can be no reasonable assurance without one and that a license condition providing for the later submission of an actual retrieval plan would be insufficient.

7. Staff adds a long argument about the flexible multi-stage licensing process and why no final repository design is required (Staff Brief at 37-39). This is relevant to Issue VI but is not relevant to Issue IX.

8. Staff argues that that the regulatory history of 10 C.F.R. Part 63 shows that the Commission "does not envision that DOE will need to build full-scale prototypes of its retrieval systems to demonstrate that its retrieval plans are practicable at the time of construction authorization" (Staff Brief at 39, quoting from the preamble to the original Part 63 at 66 Fed. Reg. at 55743). But actual plans can be required regardless of whether full-scale prototypes are also required. Moreover, Staff omits a critical portion of the relevant Commission statement that clearly supports Nevada. The Commission here indicates that "DOE can expect that its *plans and procedures* in this [retrieval] area will receive extensive, detailed review by the NRC staff as

part of any construction authorization review," that this review will include "the feasibility and reasonableness of DOE's retrieval *plans*," but that full-scale prototypes may not be necessary. *Id*. (emphasis added).

9. Staff argues that the Commission has the flexibility not to require actual retrieval plans at the construction authorization stage, but still require actual plans at the operating license stage, citing *Power Reactor Development Company v. International Union*, 367 U.S. 396 (1961) (Staff Brief at 40-41). But the issue is not whether the Commission had the flexibility to postpone the review of actual retrieval plans until the operating (receipt and possession) license stage, but whether, assuming such flexibility exists, the Commission exercised it when it promulgated Part 63.

10. Finally, Staff argues that developing actual retrieval plans at the construction authorization stage would be impossible (Staff Brief at 41-42). Staff offers no reason why this is true, except speculation that "not all [local fire and medical] services may be available at present" (Staff Brief at 41). Just because certain services may not be available at the construction authorization stage does not mean that they cannot be described at this point using placeholders for actual names and places.

C. Conclusion.

10 C.F.R. § 63.21(c)(7) requires that the application include a "description of plans for retrieval and alternate storage of the radioactive wastes, should retrieval be necessary." The regulatory language suggests, and the regulatory history of this provision compels the conclusion, that the retrieval plan being described must exist and be reviewed in full before any construction authorization can be issued.

Accordingly, the Board should decide NEV-SAFETY-169 in favor of Nevada.

X. Whether, in making the pre-construction authorization finding required by 10 C.F.R. § 63.31(a)(2), it must be considered whether, given DOE's plan to install drip shields only after all of the wastes have been emplaced, it will be impossible to make the pre-operational finding in 10 C.F.R. § 63.41(a) that construction of the underground facility has been substantially completed in accordance with the license application, as amended, the Atomic Energy Act, and applicable NRC regulations.

A. Introduction.

DOE will not install its drip shields until the end of the 100-year preclosure period, many years *after* 11,000 waste packages containing 70,000 metric ton of heavy metal (MTHM) of high-level radioactive waste have been buried (emplaced in the emplacement drifts). Thus, systems and components necessary for disposal safety (the drip shields) will not be installed until many years *after* the radiological hazards they are designed to address have already been introduced.

In its Opening Brief, Nevada argued that DOE's drip shield installation plan would undercut longstanding Commission policy and practice, incorporated in 10 C.F.R. Part 63, that a definitive safety finding must always be made before any actual radiological hazards arise, not afterwards when it may be too late, and that where complex facilities are involved, a definitive safety finding must always include a finding that systems and components necessary for safety have been properly fabricated and installed. Nevada argued further that 10 C.F.R. § 63.31(a)(2) can and must be read so as to be consistent both with this policy and practice and with the concept that it would make no sense to authorize construction of a facility that cannot possibly be allowed to operate. These considerations lead to a construction of 10 C.F.R. § 63.31(a)(2) that requires NRC to look forward to the insurmountable problem DOE will confront in applying for an operating license, and an affirmative answer to the legal question posed above.

DOE and Staff disagree with Nevada's interpretation.

B. Argument.

1. DOE and Staff do not address the regulatory safety principle that a definitive safety finding must be made before any actual radiological hazards arise, not afterwards when it may be too late. As a result, they do not address how this principle must affect the interpretation of 10 C.F.R. Part 63, and both engage in a simplistic analysis of the regulatory language that violates a cardinal rule of interpretation, namely that NRC regulations must always be construed so that they are in accord with public health and safety. *See Public Service Company of New Hampshire (Seabrook Nuclear Power Station, Units 1 and 2)*, CLI-88-10, 28 NRC 573,596 (1988).

DOE and Staff point out that 10 C.F.R. §§ 63.31(a)(2) and 63.41(a) provide for differently worded findings at the construction authorization and receipt and possession (operating) license review stages and that there is no express requirement to consider prior to construction whether a finding required before operation can be made. In particular, both point out that 10 C.F.R. § 63.31(a)(2) contains no express reference to the construction completion finding required by 10 C.F.R. § 63.41(a) (DOE Brief on Contention NEV-SAFETY-162 (DOE Issue X Brief) at 2-3 and Staff Brief at 43-44, 46).

However, the regulations should not be read myopically. As Nevada argued in its Opening Brief (at 36-38), what may be an "unreasonable risk" within the meaning of 10 C.F.R. § 63.31(a)(2) can be inferred generally from the suite of pre-operation safety findings required by 10 C.F.R. § 63.41, including the pre-operation safety findings required by 10 C.F.R. § 63.41(a) that construction "has been substantially completed in conformity with the application as amended, the provisions of the Atomic Energy Act, and the rules and regulations of the Commission." In ordinary circumstances it would make no sense to be concerned about the

status of construction completion at the pre-construction stage. But in our circumstances, we know at the pre-construction stage that a finding related to construction completion and required to be made before operation can commence cannot possibly be made. Under these circumstance it would be irrational and contrary to safety not to read 10 C.F.R. § 63.31(a)(2) broadly so that this safety problem can be taken into account.

2. DOE draws an analogy to the proceeding regarding the issuance of a construction authorization for a mixed-oxide fuel fabrication facility (DOE Issue X Brief at 3-4, referring *to Duke Cogema Stone & Webster (Savannah River Mixed Oxide Fuel Fabrication Facility)*, CLI-02-07, 55 NRC 205, 215-216 (2002)). The cited case holds that the Atomic Energy Act gives the Commission broad authority to establish two-stage licensing proceedings with distinct findings at different stages, even in materials licensing cases. However, the analogy is inapt because the applicant in *Duke Cogema Stone & Webster* did not propose to begin actual fuel fabrication before essential safety features were in place and the Commission could make a definitive safety finding. If it had, Nevada submits that the Commission would have exercised its broad authority under the Atomic Energy Act in a manner so that such a proposal would be addressed before authorizing construction.

3. DOE argues that it will not be impossible to make the pre-operational construction completion finding in 10 C.F.R. § 63.41(a)(2) because this finding applies only to completion of "any underground storage space required for initial operation" and "drip shields are not a part of the common sense meaning of the underground storage space required for initial operation" (DOE Issue X Brief at 4-5). If, as DOE argues, the term "space" means "a blank or empty area," then the finding required by 10 C.F.R. § 63.41(a)(2) is reduced to a silly and useless finding that DOE has substantially completed the construction of an area with nothing in it.

DOE's reading also would have the Commission ignore any safety problems associated with the construction of safety features in the "space," such as drift support structures and equipment for emplacing and monitoring the wastes, as well as the serious safety problem highlighted by Legal Issue X. The only reasonable reading of the term "space" is that it includes all of the structures, systems and components within the space that DOE will need to install to assure safe waste disposal.

DOE also argues here that the drip shields are not "required for initial operation" because they will be installed much later as a part of "closure" operations under 10 C.F.R. § 63.102(c). However, "required for initial operation" must mean required for *safe* initial operation, and even if drip shields are not "required for initial operation" in the limited temporal sense that DOE plans to install them only afterwards, they are certainly required for safe "initial operation" in the more relevant sense of the safety of the ultimate disposal of whatever wastes are emplaced during the "initial operation" period.

In any event, the term used in § 63.102(c) is "permanent closure," not "closure," and 10 C.F.R. § 63.2 defines "permanent closure" as the "final backfilling of the underground facility, if appropriate, and the sealing of shafts, ramps, and boreholes." There is no mention here of the installation of the drip shields, even though the Commission was aware that they were one of the engineered barriers DOE planned to install (the definition of "engineered barrier" in 10 C.F.R. § 63.2 includes "drip shields"). Moreover, under 10 C.F.R. § 63.102(c), the "period of operations" includes both the emplacement period and "any subsequent period before permanent closure, " which means that installing drip shields fits squarely within NRC's definition of "operation," to the extent that may be relevant here at all.

Finally, the Commission used the term "initial" only because it wanted to allow DOE the flexibility to emplace waste in individual drifts on a staged basis without waiting for all of the drifts to be excavated, not because it contemplated that DOE should be allowed to emplace all 70,000 MTHM of high-level waste in all of the drifts before completing the installation of structures, systems, or components required for disposal safety. *See, e.g.*, 66 Fed. Reg. 55732, 55737-55738 (Nov. 2, 2001) ("Construction is deemed substantially complete, for this purpose, if among other things, DOE has completed construction of sufficient underground storage space for *initial* operations. Thus, Part 63 provides DOE flexibility to plan for efficient repository operations for receipt and emplacement of waste because of the significant length of time required to complete excavation of the entire underground facility") (emphasis in original).

4. DOE argues that its obligation to install drip shields "will not escape regulatory scrutiny," which will include NRC confirmation that drip shields are actually installed and could include a license condition requiring that drip shields be installed (DOE Issue X Brief at 5-6). This is hardly comforting. If, after all 70,000 MTHM of wastes are emplaced, the drip shields cannot be installed, what will "regulatory scrutiny" 100 years from now accomplish? Even if retrieval of all of the wastes is technically and financially feasible, a "risk-informed" regulator would surely order retrieval only after balancing the safety risks of disposal "as is," without any drip shields, against the safety risks to workers and members of the public arising from retrieval operations. The result of such balancing of one risk against another is uncertain, but it could include leaving all of the wastes underground without drip shields, while constituting an otherwise productive portion of the Nevada accessible environment as a national sacrifice zone, polluted with radioactive wastes released in excess of the performance objectives of 10 C.F.R. Part 63.

5. Finally, DOE argues that Nevada may raise issues as to whether it is technically feasible to install the drip shields (DOE Issue X Brief at 6). But even if the outcome of the hearing process is a final decision holding that installation is technically feasible, the fundamental regulatory problem will remain that the drip shields will be installed long after the radiological hazards are introduced, making it impossible for the Commission to make a definitive safety finding before radiological hazards arise, contrary to longstanding Commission policy and practice, incorporated in 10 C.F.R. Part 63.

6. Staff argues that Nevada's construction of the regulations would "read out" 10 C.F.R. § 63.41(a) (Staff Brief at 44). This could only be true in the limited but necessary sense that if, as a result of adopting Nevada's interpretation, DOE's application is denied, then no finding under that regulation would ever be made. If Nevada's interpretation is adopted, and the application is not denied, then a finding under 10 C.F.R. § 63.41(a) will still be made.

7. Finally, Staff argues that Nevada's interpretation is contrary to 10 C.F.R. § 63.113(b), which refers to whether engineered barriers are properly designed, not to whether they have been properly constructed (Staff Brief at 45). But this argument assumes that 10 C.F.R. § 63.113(b) has the only finding required to be made before issuance of a construction authorization. As Nevada argues, and Staff acknowledges, findings must also be made in accordance with 10 C.F.R. § 63.31(a)(2).

C. Conclusion.

We know now, at the pre-construction stage, that a factual finding related to construction completion and required to be made before operation can commence cannot possibly be made, no matter how well DOE implements its stated construction plans. DOE's drip shield installation

plan cannot possibly be safe, and 10 C.F.R. § 63.31(a)(2) must be construed and applied so that this safety problem can be taken into account, before construction can be authorized.

Accordingly, the Board should decide NEV-SAFETY-162 in Nevada's favor.

XI. Whether, under 10 C.F.R. §§ 63.113, 63.114, and Part 63 Subpart G, the Performance Margins Analysis (PMA) can be used to validate or provide confidence in the TSPA, if its data and models are not qualified under DOE's quality assurance program.

A. Introduction.

In its Opening Brief, Nevada argued that DOE's PMA is of indeterminate quality and cannot be used to validate or provide confidence in the TSPA because it does not comply fully with quality assurance requirements in 10 C.F.R. Part 63 and the related requirements in DOE's quality assurance program. Staff agrees with Nevada (Staff Brief at 47 ("[I]t is the Staff's position that, under 10 C.F.R. §§ 63.113, 63.114, and Part 63 Subpart G, the PMA cannot be used to validate or provide confidence in the TSPA, because it relies on data and models that have not been qualified under DOE's quality assurance program")).[8] DOE, however, insists to the contrary.

B. Argument.

1. DOE argues that quality assurance (QA) requirements are found in 10 C.F.R. Part 63, Subpart G, not 10 C.F.R. §§ 63.113 or 63.114 (DOE Issue XI Brief at 3). Even if this is true, Nevada relies primarily on Subpart G, not the other sections.

[8] Staff qualifies its position in a puzzling way. It says that its position is "[w]ithout prejudice to the Staff's understanding that the PMA was not used to demonstrate net conservatisms or margins in the TSPA" (Staff Brief at 47, referring to its Answer to Nevada Petition for Hearing at 928). But DOE's application states specifically (at section 2.4.2.3.2.3.2.3.4, at 2.4-246) that "the PMA evaluation considers the impact of the removal of some key conservatisms." Moreover, DOE's Brief on Contention NEV-SAFETY-171 (DOE's Issue XI Brief) (at 2) explains that the PMA analyzes performance over a set of modeling cases from which "selected conservatisms used in the TSPA have been removed."

2. DOE argues that 10 C.F.R. Part 63, Subpart G does not apply to validation tools such as the PMA (DOE Issue XI Brief at 3-4). However, DOE's argument fails to account for the most directly applicable language in Subpart G. This language applies QA requirements to (among other things) "analyses of samples and data" and "scientific studies." 10 C.F.R. § 63.142(a). The gathering of scientific data to support the PMA, and the conduct of the PMA itself, including the development and selection of PMA models, clearly constitute an "analysis of samples and data" and a collection of "scientific studies." That the phrase "Performance Margin Analysis" and the acronym "PMA" do not appear in Subpart G is irrelevant if the nature of the PMA is such that it fits squarely within the scope of the regulation.

Moreover, DOE's argument goes too far. If DOE were correct, much of its TSPA would be immune from QA requirements because it is hard to see how its analytical aspects would fall within the limited categories of activities important to waste isolation listed at the top of page 4 of DOE's Issue XI Brief.

3. DOE argues that its QA program requirements and description document (QARD) does not apply to the PMA (DOE Issue XI Brief at 4). This is true. But DOE's choice to exclude the PMA from the scope of its QARD merely reflects its erroneous understanding of the scope of Subpart G and is not binding on any other party or the Licensing Board.

4. DOE argues that it may use the PMA to validate or provide confidence in the TSPA because "[t]he only regulatory restriction on the information DOE may include in its application is that all information submitted to the NRC must be complete and accurate in all material respects," citing 10 C.F.R. § 63.10(a) (DOE Issue XI Brief at 4-5). This cannot be true, because it gives no effect to other clearly applicable NRC requirements, including not only Subpart G but all of 10 C.F.R. §§ 63.114. Furthermore, a performance assessment would not be

"complete and accurate in all material respects" if applicable QA requirements are not satisfied. Moreover, DOE's argument again goes too far. If DOE were correct, its TSPA would be admissible and probative if it violated every QA requirement in Subpart G, so long as it somehow could be said to "be complete and accurate in all material respects," whatever that could possibly mean under these circumstances.

5. DOE's final argument reflects its desperation. It argues that the PMA may still be used for its intended purpose, notwithstanding that it fails to comply with 10 C.F.R. Part 63, Subpart G, because it was the subject of other "appropriate quality controls" (DOE Issue XI Brief at 5). Unfortunately for DOE, it is forced to concede here that these "appropriate quality controls" allowed the use of unqualified software and data. Accordingly, DOE's violations of Subpart G are not trivial or insignificant. In promulgating 10 C.F.R. Part 63, NRC devoted great care and attention to what QA requirements should apply to DOE's Yucca Mountain license application, and its decision to impose the requirements found in Subpart G would be rendered a nullity if other "appropriate quality controls" were to be applied instead.

C. Conclusion.

The PMA is of indeterminate quality and cannot be used to validate or provide confidence in the TSPA because it does not comply fully with quality assurance requirements in 10 C.F.R. Part 63 and the related requirements in DOE's quality assurance program (QARD).

Accordingly, the Board should decide NEV-SAFETY-171 in Nevada's favor. The PMA must be struck from DOE's license application.

CONCLUSION

Nothing in either DOE's or Staff's initial briefs provides any basis for rejecting any of the arguments in Nevada's Opening Brief.

Respectfully submitted,

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Dated: January 6, 2010

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Atomic Safety and Licensing Board

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	**Docket No. 63-001-HLW**
	)	
(High Level Waste Repository)	)	**January 6, 2010**

CERTIFICATE OF SERVICE

I hereby certify that the foregoing State of Nevada's Reply Brief on Phase I Legal Issues, has been served upon the following persons by the Electronic Information Exchange:

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