

**UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION**

**ATOMIC SAFETY AND LICENSING BOARD  
Before Administrative Judges:**

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

In the Matter of:	)	December 7, 2009
	)	
U.S. Department of Energy	)	
	)	Docket No. 63-001
(High Level Waste Repository	)	
Construction Authorization Application)	)	

**U.S. DEPARTMENT OF ENERGY BRIEF ON  
NEVADA-SAFETY CONTENTION 202 AND POST 10,000 YEAR  
ASPECTS OF NEVADA-SAFETY CONTENTIONS 011 AND 019**

**I. Introduction**

In its October 23, 2009 “Order (Identifying Phase I Legal Issues for Briefing),” Construction Authorization Board (CAB) 04 instructed that the legal issue presented by NEV-SAFETY-202 should be briefed in the same manner and pursuant to the same schedule as all other Phase I legal issues.<sup>1</sup> The legal issue to be resolved is as stated in the first sentence of the contention:

As provided in SAR Subsection 2.2.1.2 and 2.3.1.1, and as reflected in related SAR subsections, climate-change processes included as FEPs in the TSPA for the first 10,000 years are neither carried forward for the next 990,000 years, as the rule requires, nor represented by NRC’s specified deep percolation rate for that subsequent period.<sup>2</sup>

<sup>1</sup> CAB 04 stated that NEV-SAFETY-202 will be admitted, but has not yet issued an order doing so. *See* CAB 04, Order (Identifying Phase I Legal Issues for Briefing) at 1 (Oct. 23, 2009) (unpublished) (CAB 04 Order).

<sup>2</sup> *See id.*; State of Nevada’s New Contentions Based on Final NRC Rule at 2 (May 12, 2009).

CAB 04 also stated that “Legal Issues 3 and 4 are closely related to the Board’s decision on the admissibility of NEV-SAFETY-202.”<sup>3</sup> Legal Issues 3 and 4 pertain to NEV-SAFETY-11, “Human-Induced Climate Changes on Prediction of the Next Glacial Period” and NEV-SAFETY-19, “Future Infiltration Projections Need to Include Reduced Vegetation Cover,” respectively.<sup>4</sup> Because those contentions do not expand the scope of Nevada’s concern regarding DOE’s climate change analysis in the post-10,000 year period,<sup>5</sup> resolution of this contention should address any post-10,000 year aspects of Legal Issues 3 and 4.

DOE does not dispute that NRC and U.S. Environmental Protection Agency (EPA) rules require it to analyze the effects of climate change through the million-year period. As discussed below, however, neither the NRC rule nor the EPA radiation standards require that DOE carry forward the methodology used to analyze climate change in the first 10,000-year period to analyze climate change for the post-10,000 year period. To the contrary, the NRC’s rule (in both proposed and final forms) and the extensive regulatory history allow DOE to analyze climate change after 10,000 years using only the methodology prescribed by the rule.

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<sup>3</sup> See CAB 04 Order at 1. CAB 04 also added that “the Board intends shortly to admit NEV-SAFETY-202 (as stated in the first sentence of the contention) solely as a legal issue contention and to defer consideration of other aspects of that contention and its related waiver petition.” *Id.*

<sup>4</sup> See U.S. Department of Energy, State of Nevada and Nuclear Energy Institute Joint Proposal Identifying Phase 1 Legal Issues for Briefing, Attachment 1 at 2, 3 (Oct. 6, 2009).

<sup>5</sup> See State of Nevada Petition to Intervene as a Full Party at 102-06, 142-46 (Dec. 19, 2008) (Nevada Petition). Nevada also claims that NEV-SAFETY-202 “builds upon admitted contentions NEV-SAFETY-009 through 012.” Nevada Reply to DOE’s Answer to NEV-SAFETY-202 and 203 at 1 (July 16, 2009). Except for NEV-SAFETY-012, none of these contentions mention DOE’s post-10,000 year analysis of climate change. See Nevada Petition at 92-111. In NEV-SAFETY-012, Nevada references the post-10,000 year period *only* in paragraph 4 of the contention, where it alleges that DOE failed to address the post-10,000 year impacts consistent with the EPA’s final rule, but it does not explain that allegation. See *id.* at 108.

## II. Argument

The intent of the pertinent regulation, 10 C.F.R. § 63.342, is signaled by its very title: “Limits on Performance Assessments.”<sup>6</sup> That intent is reflected throughout its content.

Section 63.342(a), permits exclusion, within the initial 10,000 years, of features, events or processes (FEPs) based on either low probability or consequence, for both individual-protection and human-intrusion standards. That intent to limit analysis of FEPs is carried through to the post-10,000 year period in 10 C.F.R. § 63.342(c), which states in pertinent part:

For performance assessments conducted to show compliance with §§ 63.311(a) and 63.321(b)(2) [which address the individual protection standard and the human intrusion standard for the post 10,000 year period], DOE’s performance assessments shall project the continued effects of the [FEPs] included in paragraph (a) of this section [describing and limiting the FEPs that must be included in the first 10,000 year period] beyond the 10,000-year post-disposal period of geologic stability. DOE must evaluate all of the [FEPs] included in paragraph (a) of this section, and also:

(1) DOE must assess the effects of seismic and igneous activity scenarios [in specified, limited ways]. . . .

(2) DOE must assess the effects of climate change. The climate change analysis may be limited to the effects of increased water flow through the repository as a result of climate change, and the resulting transport and release of radionuclides to the accessible environment. The nature and degree of climate change may be represented by constant-in-time climate conditions. The analysis may commence at 10,000 years after disposal and shall extend through the period of geologic stability. The constant-in-time values to be used to represent climate change are to be the spatial average of the deep percolation rate within the area bounded by the repository footprint. The constant-in-time deep percolation rates to be used to represent climate change shall be based on a lognormal distribution with an arithmetic mean of 41 mm/year (1.6 in./year) and a standard deviation of 33 mm/year (1.3 in./year). The lognormal distribution is to be truncated so that the deep

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<sup>6</sup> Implementation of a Dose Standard After 10,000 Years, 74 Fed. Reg. 10,811, 10,829-30 (Mar. 13, 2009) (to be codified at 10 C.F.R. § 63.342).

percolation rates vary between 10 and 100 mm/year (0.39 and 3.9 in./year).

(3) DOE must assess the effects of general corrosion on engineered barriers [using a described choice of methods]. . . .<sup>7</sup>

In compliance with the rule, DOE evaluated the effects of climate change for the post-10,000 year period through 1 million years using the methodology that § 63.342(c)(2) specifically states may be used—namely, the deep percolation rate.<sup>8</sup>

**A. Section 63.342 Allows DOE to Represent Climate Change in the Post-10,000 Year Period Using Only the Percolation Rate Prescribed Therein**

10 C.F.R. § 63.342(c) specifies precisely how DOE may evaluate climate change in the post-10,000 year analysis. This language closely mirrors the EPA’s rule at 40 C.F.R. § 197.36(c). The NRC and EPA rules *generally* require that only those FEPs found to have sufficient consequence or probability of occurrence to be included in the first 10,000 year period, must also be evaluated in the post-10,000 year period.<sup>9</sup> However, § 63.342(c) requires that four specific FEPs (seismicity, igneous activity, climate change, and general corrosion) must be evaluated for the post-10,000 year period and provides acceptable methods for such evaluations.<sup>10</sup> Section 63.342(c)(2) is clear that DOE may limit its climate change analysis to the effects of increased water flow through the repository through the use of the deep percolation rate specified by NRC.

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<sup>7</sup> 74 Fed. Reg. at 10,829-30 (to be codified at § 63.342(c)).

<sup>8</sup> See SAR Section 2.3.1.1 at 2.3.1-4. SAR references in this brief are to SAR revision 1, dated February 19, 2009. The final version of 10 C.F.R. § 63.342(c)(2) uses a different deep percolation rate than the draft rule, but does not alter the methodology. DOE utilized the value in the draft rule in its SAR because the final rule was not published until nine months after the LA had been submitted for docketing in June 2008. See Proposed Rule, Implementation of a Dose Standard After 10,000 Years, 70 Fed. Reg. 53,313 (Sept. 8, 2005); Implementation of a Dose Standard After 10,000 Years, 74 Fed. Reg. 10,811 (to be codified at 10 C.F.R. § 63.342) (Mar. 13, 2009).

<sup>9</sup> See 74 Fed. Reg. at 10,829-30 (to be codified at 10 C.F.R. § 63.342(c)).

<sup>10</sup> See *id.*

**B. The Regulatory History of Section 63.342 Plainly Shows that the Prescribed Climate Change Analytical Approach was Established to Limit Undue Speculation Regarding the Post-10,000 Year Period**

**1. *The EPA's Radiation Protection Standards***

The EPA first proposed its Part 197 radiation protection standards in 1999, based upon the recommendations by the National Academy of Sciences (NAS) published in 1995.<sup>11</sup> The EPA then published a final rule containing the radiation protection standards for a 10,000-year compliance period.<sup>12</sup> In so doing, it stated:

[W]e believe that the substantial uncertainty in projecting human radiation exposures over extremely long time periods, such as a million years, is unacceptable. For example, analyzing long-term natural changes would require unprecedented performance assessment modeling of numerous and different climate regimes including several glacial-interglacial cycles. This situation could require the specification of exposure scenarios based on arbitrary assumptions rather than “cautious, but reasonable” assumptions rooted in present-day knowledge.<sup>13</sup>

In response to a legal challenge, the U.S. Court of Appeals for the District of Columbia Circuit vacated portions of the EPA's standards that addressed the time period for compliance, finding that the standards were not consistent with certain NAS recommendations.<sup>14</sup> As a result, the EPA proposed revised standards in 2005.<sup>15</sup> In doing so, the EPA proposed, among other

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<sup>11</sup> See Proposed Rule, Environmental Radiation Protection Standards for Yucca Mountain, Nevada, 64 Fed. Reg. 46,976 at 46,977 (Aug. 27, 1999) (EPA First Proposed Rule).

<sup>12</sup> See Public Health and Environmental Radiation Protection Standards for Yucca Mountain, NV, 66 Fed. Reg. 32,074 (June 13, 2001) (EPA First Final Rule).

<sup>13</sup> *Id.* at 32,124.

<sup>14</sup> See *Nuclear Energy Institute, Inc. v. EPA*, 373 F.3d 1251, 1315 (2004).

<sup>15</sup> See Proposed Rule, Public Health and Environmental Radiation Protection Standards for Yucca Mountain, NV, 70 Fed. Reg. 49,014 (Aug. 22, 2005) (EPA Second Proposed Rule).

things, to require DOE to evaluate climate change through a *focused analysis* using certain “constraints.”<sup>16</sup>

**2. *The NRC’s Implementation of the EPA’s Dose Standard in the Post-10,000 Year Period***

In 2005, after the EPA published its proposed rule extending the compliance period to one million years, the NRC proposed a revised Part 63.<sup>17</sup> In short, the NRC proposed the adoption of the EPA’s standard, including the “specific constraints on the consideration of [FEPs] after 10,000 years,” and the deep percolation rate “to represent the effect of future climate in performance assessments after 10,000 years.”<sup>18</sup> In so doing, the NRC explained:

*The Commission considers it appropriate to specify these constraints on how DOE must account for the effects of climate change during the period after 10,000 years because this approach: (1) is consistent with EPA’s proposal for treatment of climate change after 10,000 years; (2) specifies, in a straightforward way, how DOE shall represent climate change in its performance assessment; . . .*<sup>19</sup>

The NRC finalized this approach in 2009, retaining the permissible methods of analysis for each of the post-10,000-year FEPs specified in Section 63.342(c).<sup>20</sup>

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<sup>16</sup> *Id.* at 49,029. As the NRC later put it in its notice of promulgation of its final rule in March 2009:

EPA proposed that DOE’s performance assessments conducted to show compliance with the post-10,000 year individual protection and human intrusion standards shall project the continued effects of the FEPs included in the initial 10,000 year analysis. EPA also proposed *certain constraints on DOE’s performance assessments* for the post-10,000 year period. These are: . . . (3) Climate change analysis *may be limited to* the effects of increased water flow through the repository as a result of climate change, and that the nature and degree of climate change may be represented by sampling within a range of specified constant conditions . . .

74 Fed. Reg. at 10,812 (emphasis added). There is no suggestion whatsoever that FEPs analysis in this post-10,000-year period was to include anything other than the “constrained” analyses described in the notice and accompanying regulations.

<sup>17</sup> *See* 70 Fed. Reg. at 53,313.

<sup>18</sup> *Id.* at 53,315-16.

<sup>19</sup> *See id.* at 53,316 (emphasis added).

<sup>20</sup> *See* 74 Fed. Reg. at 10,829-30 (to be codified at 10 C.F.R. § 63.342(c)). Although the Final Rule changed the deep percolation rate to be used by the DOE in its climate change analysis, the methodology, and specifically

NRC shared EPA’s concern about the potential for “unbounded speculation” involved in projecting analyses out to one million years.<sup>21</sup> There is no suggestion in either the proposed or final rulemaking notices that an analysis utilizing this prescribed methodology for evaluating these FEPs in the post-10,000 period would not be sufficient under the regulations.

The NRC notice publishing the final rule explained that its modified deep percolation rates for climate change “appropriately reflect the uncertainty in the area-averaged water flux through the footprint of the potential repository during the period after 10,000 years and are a reasonable basis for estimating and evaluating the long-term safety of the repository.”<sup>22</sup>

Further, § 63.342(c) clearly does not require that DOE conduct the prescribed analysis of the deep percolation rate *in addition to* “carrying forward”, or extrapolating, its analysis of climate change in the first 10,000 year period. Were this duplicative analysis intended, such intent would have been indicated at some point in the extensive regulatory history of the NRC rule and the underlying EPA standards. Neither the NRC nor the EPA has indicated any such thing.

### **III. Conclusion**

In sum, there is no question that the NRC regulations require that DOE analyze the effects of climate change in the post-10,000 year period. They do not require, however, that DOE do so by extrapolating its analyses for the first 10,000 year period. To the contrary, the NRC permitted instead the analytical method set forth in § 63.342(c)(2), which it found to adequately bound potential effects of climate change and to provide the DOE with reasonable assurance that its performance assessment would meet the requirements of the NRC and EPA

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the constraining of the analysis of climate beyond 10,000 years to the method set forth in § 63.342(c)(2), remained unchanged.

<sup>21</sup> See *id.* at 10,815.

<sup>22</sup> See *id.* at 10,820.

regulations. DOE has used that permissible approach to model climate change. This is all that is legally required by the NRC regulations.

Respectfully submitted,

*Signed electronically by Donald J. Silverman*

Donald J. Silverman  
Counsel for the U.S. Department of Energy  
Morgan, Lewis & Bockius LLP  
1111 Pennsylvania Avenue, N.W.  
Washington, DC 20004

James Bennett McRae  
Martha S. Crosland  
U.S. Department of Energy  
Office of the General Counsel  
1000 Independence Avenue, SW  
Washington, DC 20585

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