THE NUCLEAR ENERGY INSTITUTE’S BRIEF ON PHASE I LEGAL ISSUE NO. 1

I.  INTRODUCTION

By Order dated October 23, 2009,¹ this Atomic Safety and Licensing Board accepted the joint statement of Phase I legal issues for briefing submitted by the Department of Energy ("DOE"), the State of Nevada, and the Nuclear Energy Institute ("NEI") on October 6, 2009. In accordance with CAB Case Management Order #2, dated September 30, 2009, the Licensing Board established a schedule for briefs on the issues by the affected parties. NEI herein briefs Legal Issue No. 1, pertaining to its contention NEI-SAFETY-005.

II.  ISSUE

NEI-SAFETY-005 challenges the postclosure criticality analysis described in Section 2.2.1.4.1.1 of the License Application ("LA") Safety Analysis Report ("SAR") because, among other reasons, it is inconsistent with applicable regulations requiring that occupational doses be maintained “as low as reasonably achievable,” or “ALARA.” As summarized in the joint statement of legal issues:

NEI alleges that DOE’s LA violates 10 C.F.R. §§ 20.1002, 20.1003, 20.1101, 50.40 and 63.111 because the “safety margin” is so substantial and excessively conservative that it will lead to the unnecessary insertion of disposal control rod assemblies into some fuel assemblies at nuclear power plants prior to shipment for disposal. This safety margin is allegedly inconsistent with the principles of ALARA because it will lead to unnecessary occupational radiation exposures, economic costs and environmental costs.

More fully, as articulated in NEI’s Petition to Intervene, the contention asserts that DOE’s postclosure criticality analysis will effectively require licensees to unnecessarily insert control rods for criticality control into some fuel assemblies prior to transportation to the repository site. This requirement will: (a) increase occupational doses to workers at the reactor sites tasked with inserting the control rods; (b) increase operational complexity and environmental costs associated with the loading and shipping operations; (c) require unnecessary design and operational costs to be paid out of the Nuclear Waste Fund; and (d) potentially cause delays in the licensing of new Transportation, Aging and Disposal (“TAD”) canister designs.2

The joint statement of the parties specifies that the threshold legal issues for NEI-SAFETY-005 are:

(1) whether the above regulations [10 C.F.R. §§ 20.1002, 20.1003, 20.1101, 50.40, and 63.111] require ALARA considerations at individual nuclear plant sites remote from the [Geologic Repository Operations Area] to be addressed in DOE’s LA; and

(2) whether DOE must demonstrate that the repository not only meets applicable safety and environmental regulatory standards, but must show that it does so without any alleged unnecessary expenditures of resources.

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III. ARGUMENT

DOE and the NRC Staff previously opposed admission of NEI-SAFETY-005 on the grounds that the impacts of the facility design as described in the LA SAR that occur outside the Geologic Repository Operations Area (“GROA”) are outside the scope of the hearing. Further, the NRC Staff argued that the contention does not properly allege a violation of NRC requirements because it is a challenge to a postclosure analysis that is beyond the scope of the ALARA requirement. The issues associated with these arguments were fully briefed prior to the Licensing Board decision to admit the contention. Only the NRC Staff appealed the admissibility of the contention, again arguing that the contention does not raise a material issue. The issues raised in support of the Staff’s argument on appeal were therefore briefed again before the Commission. In CLI-09-14, the Commission did not disturb the Licensing Board’s admissibility ruling. CLI-19-14, slip op. at 27 (June 30, 2009). Accordingly, it is not at all clear why the parties have another bite at this apple. The legal arguments that would preclude a full hearing with respect to NEI-SAFETY-005 should be rejected at the threshold, and the contention should be appropriately considered on the merits. Nonetheless, NEI herein addresses the issues — now styled as threshold legal issues rather than contention admissibility issues.

A. NRC Regulations Require that the LA Address Preclosure ALARA Considerations at Nuclear Plant Sites Remote From the Repository

As articulated previously by DOE and the NRC Staff, the arguments that ALARA principles do not apply to the postclosure criticality analysis in the SAR fall into two categories:

- ALARA principles do not apply to the postclosure criticality analysis at issue; and

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3 See “The Nuclear Energy Institute’s Brief in Opposition to NRC Staff’s Appeal of LBP-09-06,” dated June 1, 2009, at 6-16, 28-30.
ALARA principles are limited to activities physically within the GROA, and therefore dose and other impacts at Part 50-licensed reactor sites are outside the scope of the proceeding.

Both of these arguments are invalid. First, the ALARA considerations at issue in this contention relate to the preclosure or operational phase of the repository, and therefore under the regulations must be considered. Second, there is no limit in the geographical reach of the applicable ALARA regulations that would preclude consideration of occupational doses at reactor sites that are linked to disposal at the repository. Each of these arguments is discussed below.

1. **Preclosure ALARA Implications Must Be Addressed**

NEI in this contention challenges an aspect of the LA that would cause, among other things, unnecessary occupational doses. NEI seeks to show that, because there is unnecessary conservatism in DOE’s approach to achieving the postclosure performance objective for criticality, it can revise its approach in a way that would meet regulatory requirements for the postclosure safety analysis while, consistent with applicable ALARA principles, reduce radiological doses during the operational phase of the Yucca Mountain repository. Indeed, such revisions are compelled by the ALARA requirements.

The NRC’s Part 20 regulations by their terms specifically apply to the repository application. Section 20.1002 states expressly — and without limitation — that Part 20 regulations apply to Part 63 licensees. Further, Section 20.1101(b) provides that licensees (including Part 63 licensees) use, to the extent practical, procedures and engineering controls to achieve occupational doses and doses to members of the public that are ALARA. Separately, the NRC’s Part 63 regulations applicable to the proposed repository provide that the “geologic repository operations area must meet the requirements of part 20 of this chapter.” 10 C.F.R. § 63.111(a). (The NRC Staff and DOE have read this latter regulation narrowly to argue that it
limits the geographical scope of the application of ALARA. That argument is addressed in Section III.A.2 below.)

The Commission’s intent that ALARA principles be applied to the licensing of the Yucca Mountain repository under Part 63 with respect to the operational and decommissioning phases of the repository is addressed in the Final Rule, “Disposal of High Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada,” 66 Fed. Reg. 55,732, 55,751 (November 2, 2001). In the Statement of Considerations the Commission clearly stated that:

. . . it is appropriate to explicitly require the application of the ALARA principle to the operational and decommissioning phases of the repository . . . .

The Commission further explained:

The ALARA principle deals with optimizing the reduction of potential doses from radiation to members of the general public and workers. . . . Application of ALARA during operations compels the consideration of the benefits of further reduction in potential doses to present-day populations and workers relative to impacts to present-day populations (e.g., increased cost to reduce potential doses further).

Id. (emphasis added). Thus, the Commission fully anticipated consideration of dose benefits to “present-day populations” relative to present-day impacts, such as costs.

The NRC Staff has read the Statement of Considerations to somehow prohibit application of ALARA in the manner proposed in NEI-SAFETY-005. Assuredly, the Commission explained that:

. . . the application of ALARA to achievement of the long-term performance objective is not appropriate.

Id. In other words:

. . . although the Commission will require ALARA considerations for the operational phase and decommissioning of the surface facilities, NRC will
not explicitly require an ALARA analysis as part of the postclosure performance assessment.

*Id.* The Commission also expanded on its rationale for distinguishing between considering ALARA in the context of the operational phase and in the context of the postclosure phase, as follows:

The application of ALARA to the achievement of the postclosure performance objective would involve considerations far more complicated than those evaluated for operations. The reasonableness of further reduction of potential doses would need to evaluate benefits and impacts that span many generations (e.g., costs incurred today versus a reduction of potential doses thousands of years in the future; repository designs that reduce potential doses in the future but increase doses to present-day workers during fabrication of the design such as installing a special backfill)....

*Id.*

From this discussion the NRC Staff has argued that, if application of ALARA could lead to a change to a design element or design parameter relevant to the postclosure performance objective, then ALARA is beyond the scope of this proceeding. This argument is based on a faulty reading of the Statement of Considerations and an unfounded extrapolation of the Commission’s explanation. In fact, as is clear from the Statement of Considerations, the Commission sought only to avoid layering a postclosure ALARA consideration on top of a postclosure performance objective that it found to be already sufficiently conservative.

The Commission was concerned that achieving doses that are ALARA in the distant postclosure future would require a difficult cross-generation cost-benefit analysis. It does not follow that the

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4 Consideration of future, postclosure ALARA benefits was deemed by the Commission to be unnecessary in light of the conservative public dose limits adopted for licensing by the Environmental Protection Agency. The dose limits will “ensure that public health and safety and the environment are protected” in the long term. 66 Fed. Reg. at 55,751. This conclusion was further confirmed by the National Academy of Sciences finding that “deep geologic disposal, by its very nature, was ALARA....” *Id.*
Statement of Considerations can be extended to preclude contentions that address ALARA in the preclosure period.

NEI’s contention focuses on certain repository design or operational parameters and assumptions which are unnecessary to achieve postclosure objectives. NEI’s contention seeks to reduce preclosure occupational dose impacts on workers, consistent with ALARA principles and precisely as contemplated by the Commission and the regulations. The contention does not seek to apply ALARA principles to the repository for the postclosure phase. NEI’s contention also would not change the nature of the required analysis or the standard for demonstrating adequate postclosure performance. The contention asserts only that the existing postclosure performance objectives can be met without the control rods that cause present-day dose impacts.

In the Statement of Considerations the Commission gave two examples of the difficult assessments that it would face if it were to apply ALARA to the postclosure performance objectives: (1) costs incurred today would need to be balanced against a “reduction of potential doses thousands of years in the future” or (2) designs that could “reduce potential doses in the future” would need to be balanced against increased doses to present-day workers during installation. Both examples involve the “need to evaluate benefits and impacts that span many generations.” See 66 Fed. Reg. at 55,751. However, NEI’s contention does not match either example, and in fact presents no issues requiring cross-generational assessment of costs and benefits. Unlike both of the Commission’s examples, the contention does not involve future, postclosure dose benefits in any way. The contention deals with preclosure dose benefits. The
only question related to postclosure performance is one of compliance with the performance objective — and this is an issue clearly within the scope of the proceeding.5

In sum, NRC’s regulations require that the repository design address ALARA implications during the preclosure phase of repository operations. Accordingly, NEI-SAFETY-005 raises a legitimate question regarding whether worker doses can reasonably be reduced by eliminating conservative assumptions in the postclosure criticality evaluation.

2. **ALARA Considerations Are Not Limited to the GROA**

Assuming that ALARA principles apply to preclosure activities, DOE and the NRC Staff have previously suggested that, to the extent DOE design assumptions or specifications cause 10 C.F.R. Part 50 reactor licensees to undertake activities which would cause unnecessary radiological exposures to Part 50 facility workers, consideration of those consequences is outside the scope of the regulations and therefore outside the scope of this proceeding. This view is unsupported by, and inconsistent with, the regulations. The consequences of proposed repository design elements or operating parameters that directly cause reactor licensees to undertake unnecessary activities resulting in unnecessary operational occupational doses for plant employees or members of the public are within the mandated scope of ALARA as applied to the preclosure phase of repository operations.

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5 Under the NRC Staff’s interpretation, no matter how readily preclosure ALARA considerations could be applied to significantly reduce operational radiological exposures and costs, a contention that could have any impact on the physical design of the repository would not raise an issue material to this proceeding, irrespective of whether postclosure performance objectives would continue to be met. The Staff’s approach would preclude virtually all contentions with preclosure operational ALARA implications.
As discussed above, 10 C.F.R. § 20.1002 states that Part 20 applies to persons holding NRC licenses under 10 C.F.R. Part 50 and 10 C.F.R. Part 63. Further, 10 C.F.R. § 20.1101(b) expressly states that “licensee[s] shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are [ALARA].” Section 10 C.F.R. § 20.1003 defines “ALARA” as “making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed material in the public interest.” These regulations do not limit the geographical reach of their applicability in any way. Instead, they require Part 63 licensees to achieve doses ALARA “to the extent practical” — including “occupational doses” and doses to “members of the public.” “Occupational doses” are at the heart of NEI-SAFETY-005. And, at a minimum, doses to “members of the public” clearly encompass doses experienced offsite from the repository.6

DOE and the NRC Staff may attempt to distinguish offsite doses due to activities that occur offsite from those due to operations that occur within the GROA. However, the distinction has no basis in the language of either Section 20.1101(b) or Section 20.1003. There is no mention of the location of the activity causing the worker doses or the doses to the members of the public. The regulations, therefore, are limited only by a tacit causation standard.

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6 Part 50 reactor licensees are subject to the same ALARA requirements as DOE in this case. For Part 50 licensees the ALARA requirement extends to doses due to normal operations and expected operational occurrences. See 10 CFR § 50.34a(a). These doses subject to the ALARA requirement also occur offsite from the reactor. The NRC has established numerical guidelines in 10 CFR Part 50, Appendix I for meeting the offsite ALARA requirement.
That is, if the doses are caused by the applicant, attendant to the proposed facility, they are subject to the ALARA standard wherever they may occur. If doses caused by the repository design or operations were excluded from the ALARA requirement simply because the doses would be offsite, DOE could avoid consideration of direct impacts from the repository simply by shifting any number of operational activities away from the GROA to reactor (or other) locations.7

DOE and the NRC Staff have previously cited the language of 10 C.F.R. § 63.111(a) as limiting the physical scope of the application of ALARA. However, the regulation is not phrased as a limit. Rather, it states that the “geologic repository operations area” must meet the requirements of Part 20. This affirmative requirement does not state that offsite doses are excluded from consideration. Indeed, such a reading would be inconsistent with the regulatory context. The additional affirmative requirements of 10 C.F.R. §§ 20.1002 and 20.1101(b) apply to Part 63 and are not constrained by the borders of the GROA. Moreover, the Commission’s Statement of Considerations in connection with the promulgation of Part 63 discussed above again demonstrates the scope of the ALARA requirement and the scope of the evaluation that the Commission found to be appropriate:

The ALARA principle deals with optimizing the reduction of potential doses from radiation to members of the general public and workers. . . . Application of ALARA during operations compels the consideration of the benefits of further reduction in potential doses to present-day populations and workers relative to impacts to present-day populations (e.g., increased cost to reduce potential doses further).

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7 In CLI-09-14, slip op. at 20, n. 93, the Commission noted that “in context of NEI’s standing, CAB-03 found unpersuasive DOE’s argument that ‘health and safety impacts felt at distant nuclear plant sites caused by the delay in completion of its proposed repository are outside the scope of the proceeding.’” LBP-09-6, 69 NRC ___ (slip op. at 79).”
66 Fed. Reg. at 55,751 (emphasis added). The Commission’s references to “the general public and workers” and “present-day populations and workers,” 66 Fed. Reg. 55,751, by their plain meaning, include all populations and workers, including those at Part 50 reactor sites. Had the Commission wanted to limit its consideration only to populations near, and workers at, the repository or within the GROA, it could have and presumably would have so stated.\(^8\)

At bottom, NEI-SAFETY-005 seeks to avoid or significantly reduce the radiological doses that would be incurred to certain “present-day populations and workers” — which is wholly consistent with the Commission’s own description of the scope of ALARA considerations in this proceeding. The Commission will grant the Part 63 construction authorization if it determines that the proposed design poses no “unreasonable risk to the health and safety of the public” when considering, among other things, the adequacy of “DOE’s proposed operating procedures to protect health and to minimize danger to life or property.” See 10 C.F.R. § 63.31. DOE therefore must consider dose impacts that occur within the GROA and at reactor sites — where those dose impacts could be avoided if DOE were to change certain design elements for criticality control, without compromising acceptability of postclosure performance.

B. **DOE Must Demonstrate that the Repository Meets Applicable Safety and Environmental Standards, Without Unnecessary Margin**

In NEI-SAFETY-005, NEI asserts that DOE’s overly conservative postclosure criticality analysis will have consequences, including the preclosure ALARA implications already discussed. Given that ALARA applies to the preclosure safety analysis, the contention

\(^8\) In this context, the reference to the “geologic repository operations area” can be read as an affirmative indication of the Commission’s intent that all activities at the facility, including the repository, surface facilities, and operations area, are subject to the preclosure ALARA requirement. Activities in those areas must be conducted to maintain doses ALARA — with no limit on the location of the dose impacts.
addresses a material violation and was properly admitted for hearing. As stated in the contention and supporting statements, there are other potential consequences associated with the unnecessary control rods assumed in the LA SAR. These consequences include the unnecessary operational complexity and increased environmental impacts caused by the control rods, increased costs to be paid from the Nuclear Waste Fund, and potential licensing delays with respect to TAD canisters or with respect to this proceeding. The threshold legal issue questions only whether DOE must demonstrate that there are no unnecessary expenditures associated with the proposed design. In the case of the criticality analysis, these expenditures do need to be considered, along with the other practical considerations highlighted by NEI.

First, the unnecessary costs, operational complexity, environmental impacts, and even the lack of need for margin in the postclosure criticality analysis, are all factors that would support a conclusion that the DOE proposal is not maintaining occupational doses as low as *reasonably* achievable. The NRC’s regulations, in 10 C.F.R. 20.1003, define ALARA as “making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.” This definition certainly provides sufficient scope for consideration of costs and other implications of the proposed criticality control rods, in the context of the unnecessary occupational doses that the control rods would cause.
In *Public Service Co. of Oklahoma.* (Black Fox Station, Units 1 and 2) 10 NRC 775, 81-82 (1979), the ASLB stated that “by the terms of its definition, the ALARA standard necessarily invokes a cost-benefit balancing process.” Similarly, in *Yankee Atomic Energy Co.* (Yankee Nuclear Power Station), CLI-96-01, 43 NRC 1 (1996), the Commission explained the ALARA analysis as follows: “[A] licensee's actions do not violate the ALARA principle simply because some way can be identified to reduce radiation exposures further. The practicality and the cost of the measures required to achieve these reductions as well as ‘other societal and socioeconomic considerations’ must also be taken into account.” Fully consistent with these explanations of the inquiry required under the ALARA standard, the cost considerations cannot be summarily excluded from the hearing on NEI-SAFETY-005.

Second, the unnecessary margin built into the criticality analysis will result in unnecessary costs to be paid from the Nuclear Waste Fund. This licensing matter is being conducted in accordance with the Nuclear Waste Policy Act of 1982 (“NWPA”), 42 U.S.C. §§ 10101 – 10270. The NWPA establishes a comprehensive statutory program for the development of the high level waste repository. The explicit goal of the NWPA is for DOE to site and the NRC to conduct a licensing review of a high level waste repository. See, e.g., 42 U.S.C. § 10131. The NWPA further establishes the means to fund the repository. *Id.* In this context, the cost implications of the DOE plan for criticality control are a particularly compelling consideration. The NWPA adds a factor to the NRC licensing decision that does not exist in other NRC licensing proceedings based only on the Atomic Energy Act or the National Environmental Policy Act. The design, licensing, funding, construction, and operation of the repository clearly involve issues beyond the simple question presented by DOE (that is, whether the design meets legal requirements). Excess conservatism could clearly threaten the goal of
Congress to assure construction of a repository and to assure sufficient revenue to cover the cost. It is therefore a significant issue that merits consideration in this proceeding. And, even if it were not a consideration directly material to the NRC’s decision under the NWPA alone, it certainly is a consideration that needs to be considered in implementing the NRC’s ALARA requirement.

Finally, apart from the economic cost perspective, a showing that DOE’s LA exceeds minimum regulatory compliance remains a material consideration — at least where it has been specifically raised by a party as NEI has done in NEI-SAFETY-005. If NEI can show excess conservatism in the analysis, such a showing should be reflected in the Licensing Board decision, thereby altering the licensing basis for the project. Relief in the form of a change in the licensing basis would increase DOE’s flexibility in the future in developing, constructing, and operating the facility. Where the matter has been placed in controversy by an intervenor, a Licensing Board is certainly free to determine how far a design needs to go to establish minimum compliance in order to assure a clearly defined licensing basis that will guide the licensee going forward.

Applicants also routinely demonstrate compliance with licensing requirements in the hearing process by demonstrating margin in the supporting analyses. NEI is a party that, despite some specific disagreements with aspects of DOE’s approach, ultimately supports the proposed licensing action. To the extent NEI’s contention seeks to establish conservatism in an

9 Certainly if the NRC Staff were proposing that DOE must include control rods to meet NRC requirements, DOE would be free to challenge that Staff position in the hearing process. There is no reason that NEI should not be able to pursue the same type of challenge when the relief would benefit is members.

10 In this regard, the Licensing Boards would not necessarily need to order a change to the design. Ultimately, the final design may be a matter of DOE prerogative, so long as it meets NRC’s regulations. However, the licensing basis should nonetheless be clear.
analysis, that conservatism can be considered. As one Licensing Board wrote in an initial decision:

The existence of uncertainty dictates that we cannot find reasonable assurance of safety for operation in the interim based on model calculations alone. We conclude, however, that it is appropriate to also rely on the fact that the analyses were consistently performed in conservative manner and that margins of safety exist. Thus, we conclude that CLASIX-3 computations, while not completely accurate, bound the conditions that would actually prevail during a hydrogen burn event in Perry containment.

*Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 & 2), LBP-85-35, 22 NRC 514, 543-44 (1985). Supportive petitioners have rarely appeared in NRC licensing cases. There is no case law suggesting that a project supporter in general, or NEI in particular, is precluded from demonstrating conservatism, or even undue conservatism, in the design. Proving excess conservatism (or licensing margin) will at a minimum support a finding of compliance, advance the licensing case, and reduce uncertainty and delay related to licensing the project.

In sum, the safety margin inherent in the criticality analysis and criticality control method proposed by DOE, and the cost and other consequences that will result, must be considered by the Licensing Board. At a minimum, these factors must be considered as part of the required assessment of whether occupational and public doses in the preclosure period will be ALARA. More broadly, these factors are inherent in the goals of the NWPA. Addressing the safety margin is also essential to determining whether in fact the proposal will meet NRC minimum requirements and to determining the appropriate licensing basis for the facility going forward.

**IV. CONCLUSIONS**

For the foregoing reasons, the Licensing Board should conclude that:
- NRC regulations in Part 20 and Part 63 require that DOE and the NRC consider preclosure ALARA implications at reactor sites in connection with the postclosure criticality analysis for the proposed repository.

- The Licensing Board may properly consider the excessive margin provided in the LA criticality analysis and the related costs in its consideration of ALARA. The Licensing Board can also consider the issue of margin in its decision in order to avoid unnecessary environmental impacts and unnecessary expenditures from the Nuclear Waste Fund, and to avoid unnecessary future operational rigidity and complexity caused by the conservative licensing basis.

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Dated in Washington, D.C.  
this 7th day of December 2009
In the Matter of

U.S. DEPARTMENT OF ENERGY
(High-Level Waste Repository)

Docket No. 63-001-HLW
ASLBP No. 09-892-HLW-CAB04

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing “The Nuclear Energy Institute’s Brief on Phase I Legal Issue No. 1” have been served upon the following persons on this 7th day of December, 2009 by Electronic Information Exchange.

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