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April 19, 2007

The Honorable Dale Klein  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

**RE: Denial of Safety Credit for DOE's Use of "Drip Shields"  
In the Proposed Yucca Mountain Repository**

Dear Mr. Chairman:

I write to draw the Commission's attention to a critical safety and legal issue that has been disregarded by the NRC Staff in its pre-licensing interactions with DOE on the proposed nuclear waste repository at Yucca Mountain. The issue is whether any safety credit should be given to so-called "drip shields" in the post-closure repository performance assessment when, as explained below, it is doubtful that the drip shields would ever be installed.

DOE's calculations to demonstrate compliance with federal radiation standards have relied heavily on the protection of the waste packages from dripping water by means of an underground system of connected titanium "drip shields." These are a kind of a series of titanium tents covering the entire length of waste package emplacements in the repository tunnels, or "drifts." We have been informed that DOE's Yucca Mountain license application ("LA") will also rely heavily on drip shields to keep water off waste packages.

The idea of using drip shields as a part of the Engineered Barrier System ("EBS") for the repository arose in the mid-1990s after DOE discovered that, contrary to previous expectations, Yucca Mountain's rock was highly fractured and allowed fast flow paths

for infiltrating water. Such water would of course accelerate corrosion of the thousands of radioactive waste packages. At about the same time, DOE discovered from *in-situ* heater simulation tests that the spent fuel would cause water to collect above the drifts and drip down on the packages, which provided another incentive to find a means to divert water.

In DOE's various public presentations of the results of its Total Systems Performance Assessment ("TSPA") for the repository, the drip shields' protection is critical to lowering the resultant dose to humans in the biosphere. Counting the drip shields (leaving aside considerations of whether they will perform as proposed) might make sense if DOE actually planned to install the drip shields when it emplaced waste packages. But that is not at all what DOE plans to do—it doesn't plan to install them until repository *closure*, which could be up to 300 years from now. It is understandable that DOE would want to put off installation indefinitely because of the huge expense and complications involved. But the flip side is that NRC should accordingly not allow DOE to include the drip shields in its TSPA post-closure calculations in support of its LA.

The scope and scale of the project for manufacturing and installing the proposed drip shields would be enormous. The drip shields would be made of Titanium 7, would weigh about four tons each, and the repository would need at least 12,500 of them. DOE would have to buy an amount of very expensive Titanium metal equal to three-and-one-half years of the entire U.S. domestic production at a cost of at least \$5 billion.

A fundamental problem with putting off drip shield installation for decades and perhaps centuries is that it is extremely unlikely that it will even be possible to install them at all. The effort would be unprecedented. Because of the high temperatures and extremely high radiation fields in the repository drifts, the drip shields would need to be installed remotely, using as-yet-nonexistent robotics. The drift environment will be heavily dust-laden, which will make remote visual monitoring of placement operations difficult if not impossible. It will be extremely difficult if not impossible to install the drip shields within the projected tight clearances in the drifts. Installation equipment will have to be brought by electric locomotives of a kind not yet in existence. The rails over which they would have to travel, and the rails supplying electric power, will almost certainly have corroded by the time they are needed. The installation equipment will need to be custom-designed to operate reliably in a dusty, hot, and radioactive environment, and will need a means for retrieval and repair of disabled equipment. DOE has recognized that there are so many uncertainties and potential difficulties with drip shield installation that "field tests to determine feasibility of operations *will be required.*" See DEN 001480432 (emphasis added). It is doubtful, however, that realistic field tests can even be performed. DOE has even conceded that "human beings probably cannot reliably make a drip shield." See DEN001227105 (emphasis added). Additionally, anticipated rock-fall would likely by itself make installation of the connected drip shield structures physically impossible.

These and other serious technical problems with DOE's drip shield proposal are explained and documented in a presentation to the Nuclear Waste Technical Review

Board (“NWTRB”) by Nevada’s mining expert Mr. Frank Kendorski in November 2005; in an NWTRB letter to DOE dated December 19, 2005; in a June 2006 report from CNWRA (Center for Nuclear Waste Regulatory Analysis) entitled “Review of Tools and Techniques to Monitor Repository Excavations;” in an August 2006 report from CNWRA entitled, “Summary of Current Understanding of Drift Degradation and Its Effects on Performance at a Potential Yucca Mountain Repository;” and in a letter from NRC Staff to DOE dated January 18, 2007. Each of these items is enclosed.

Given the uncertainties over whether the drip shields would ever be installed, it would make a mockery of the TSPA calculation to include them. NRC should not allow DOE to rely on uncertain future actions. Nor can NRC cope with this situation by imposing a license condition. The time from issuance of a repository operating license to the repository’s permanent closure could be three-hundred years. *See* Part 63 Preamble, 66 Fed. Reg. 55738, 55743 (2001). Thus, DOE’s proposal *presumes the enforceability of a license condition requiring the installation of successfully working drip shields up to three hundred years after waste emplacement*, longer than the existence of the United States. No license condition like this has ever been considered by NRC or even seriously proposed.

Moreover, there are at least two fundamental problems with enforceability. First, the notion assumes the continued existence for hundreds of years of what the National Academy of Sciences refers to as “active institutional control.” Reliance on continuing enforceability would therefore be contrary to the Academy’s recommended conclusion that, beyond some initial period of time, the ability to rely on active institutional systems diminishes in a way that is intrinsically unknowable. *See* “Technical Basis for Yucca Mountain Standards,” NAS (2001), at p. 106.

More importantly, the license condition would be intrinsically unenforceable. If it will be impossible to install the drip shields, as is almost certain, what could any regulator do?

In sum, DOE’s proposal that its TSPA will include critical safety credit for drip shields to be installed up to three hundred years after waste emplacement conflicts with the technical possibilities, with a realistic assessment of the value of institutional commitments, and therefore with a common sense reading of the law. In the past, NRC has refused to give similar proposals any serious consideration. *See Houston Lighting and Power Co. (Allens Creek Nuclear Generating Station, Unit 1)*, ALAB-629, 13 N.R.C. 75 (1981).

Because of all the above, Nevada respectfully requests NRC to advise DOE that, absent a drastic change in DOE’s drip shield installation plans, DOE should not claim,

and NRC cannot legally allow, any safety credit for drip shields in DOE's TSPA for the upcoming Yucca Mountain License Application.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert Loux", with a large, sweeping flourish at the end.

Robert Loux  
Executive Director

cc: DOE  
TRB  
ACNW  
Nevada Congressional Delegation