

September 5, 2012

Mr. David A. Lochbaum  
Director, Nuclear Safety Project  
Union of Concerned Scientists  
P.O. Box 15316  
Chattanooga, Tennessee 37415

Dear Mr. Lochbaum:

On behalf of the Commission, I am responding to your letter dated May 7, 2012, in which you expressed a concern that the ongoing spent fuel pool scoping study does not consider issues other than seismically induced loss of inventory and cooling and that the study's results will either misinform the U.S. Nuclear Regulatory Commission's (NRC's) regulatory decisions or delay them, as gaps are addressed. Thank you for your timely and constructive feedback regarding the scoping study.

The scoping study will provide updated consequence estimates for scenarios of interest related to a spent fuel pool, as well as to inform the NRC's determination of whether a significant increase in safety would be gained through expedited transfer of spent fuel to dry cask storage. The extreme conditions experienced at the Fukushima Dai-ichi plant demonstrated that spent fuel pools are highly robust structures. During the earthquakes, tsunami waves, and subsequent plant hydrogen explosions, the spent fuel remained adequately cooled through the addition of water to make up for water lost during the original earthquake and from subsequent evaporation. Additionally, the enhancements to spent fuel pool safety required by Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(hh)(2) strengthen the NRC's view that spent fuel pool storage is safe. Implementation of NRC Orders requiring mitigation strategies for responding to extreme natural events and the installation of enhanced spent fuel pool instrumentation to ensure reliable and available water level indication will further enhance spent fuel pool safety. However, the NRC still believes a thorough evaluation of expedited fuel transfer is appropriate. The staff is evaluating the need for expedited fuel transfer as part of the Tier 3 recommendations described in SECY-12-0025, "Proposed Orders and Request for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," and SECY-12-0095, "Tier 3 Program Plans and 6-Month Status Update in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Subsequent Tsunami."

In your letter, you mentioned the following three areas that should be included in the spent fuel pool scoping study:

**Criticality:** The NRC agrees it is very important to prevent inadvertent criticality in the spent fuel pool, and we have been addressing this issue in spent fuel pool-related licensing actions for several years.

In addition, on May 21, 2010 (before Fukushima Dai-ichi), the Office of Nuclear Reactor Regulation (NRR) issued its "On Site Spent Fuel Criticality Analyses NRR Action Plan" (Agencywide Documents Access and Management System Accession No. ML101520463). Goals in the NRR action plan include developing NRC regulatory guidance on the performance of spent fuel pool criticality analyses, and the use and monitoring of installed neutron absorbing materials. A spent fuel pool criticality session at the 2010 Regulatory Information Conference and several public meetings in 2009 informed the NRR action plan. The NRC's continuing focus on this topic was highlighted in the opening remarks provided by Mr. R.W. Borchardt, NRC Executive Director for Operations, during the 2012 Regulatory Information Conference.

While high-density spent fuel storage rack loading configurations utilizing neutron absorber material and administrative controls can be more complex than low-density storage rack geometric configurations, the high-density configurations, when properly implemented, can provide safe storage of spent fuel. Technical specifications outline these requirements for spent fuel storage. Additionally, nominal center-to-center distance between fuel assemblies in the spent fuel racks is typically a technical specification requirement.

The enforcement actions you reference demonstrate that the NRC is using its regulatory authority to ensure compliance with the regulations related to safe fuel storage in the spent fuel pool. We expect to evaluate the results of the NRR action plan to determine the need for any new regulations, changes to existing spent fuel pool criticality requirements, or changes to guidance documents.

**Design and Licensing Basis Accidents:** The NRC agrees that a comprehensive design and licensing basis for safe storage of spent fuel is important. It is worth noting that the safe storage of spent fuel is controlled by more than technical specifications. Each facility's safety analysis report includes a number of initiating events that are considered design or licensing basis accidents. Based upon those design or licensing basis accidents, the facility's technical specifications establish limiting conditions for operation. These limits are associated with initial conditions for key systems immediately necessary to mitigate events that either assume failure of or pose a challenge to the integrity of a fission product barrier, consistent with the requirements of 10 CFR 50.36, "Technical Specifications." The safety analysis report includes many design and operational limits that provide protection for slower evolving events that do not directly challenge fission product barrier integrity. The NRC has determined that regulatory requirements applicable to equipment and events described in the facility safety analysis report are adequate to provide reasonable assurance of spent fuel safety.

The technical specification you referenced on minimum spent fuel pool water levels, applicable during fuel movement, is intended to ensure mitigation of a fuel handling accident. The requirement to prevent an unacceptable reduction in spent fuel pool level is found in the Design Features section of the technical specifications, and it applies at all times. The Design Features in the technical specifications require that licensees design and maintain the spent fuel storage pool to prevent inadvertent draining of the pool. While this does not impose an operational limit on spent fuel pool water level, it requires licensees to maintain the design features that prevent inadvertent drainage described in the safety analysis report.

In March 2012, the NRC issued Order EA-12-051, which requires licensees to install reliable means of remotely monitoring wide-range spent fuel pool levels to support effective prioritization of event mitigation and recovery actions in the event of a beyond-design-basis external event. In addition, the NRC issued Order EA-12-049, which requires that licensees develop, implement, and maintain guidance and strategies to preserve or restore core cooling, containment, and spent fuel pool cooling capabilities following a beyond-design-basis external event. Upon full implementation of these orders at nuclear power plants, spent fuel pool safety will be enhanced.

**Operations with the Potential to Drain the Spent Fuel Pool:** The NRC agrees it is important to control potential paths that could drain the spent fuel pool cooling water. Consistent with the requirements of Criterion 61, "Fuel Storage and Handling and Radioactivity Control," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," or similar design requirements, spent fuel pools are designed to prevent a substantial loss of water inventory under normal and accident conditions. A substantial loss of inventory is prevented by design, typically through the absence of drains in the spent fuel pool, the location of piping penetrations through the spent fuel pool structure, and the use of design features to prevent siphoning of water. The technical specifications require that licensees' design features be maintained to prevent the inadvertent drainage of the spent fuel pool. Thus, the design of the spent fuel pool effectively limits the potential for draining the pool under design-basis conditions.

The spent fuel pool scoping study is analyzing a beyond-design-basis event that could degrade the pool's liner integrity. The NRC will review the results of the study as part of the post-Fukushima Dai-ichi Tier 3 action item, "Program Plan for Transfer of Spent Fuel to Dry Cask Storage," which will assess if any significant safety benefits (or detriments) would occur from expedited transfer of spent fuel to dry casks.

In conclusion, the NRC believes the spent fuel pool scoping study, the NRR Action Plan for Spent Fuel Criticality Analyses, recently issued NRC orders, and the agency's ongoing efforts to better understand and respond to the Fukushima Dai-ichi event adequately address the points you raise. Additionally, it is the NRC's intent to holistically evaluate the spent fuel pool issues within the framework of our currently established regulations. The NRC welcomes input from all external stakeholders as the agency moves forward with this evaluation.

In addition, the NRC continues to monitor ongoing international efforts to understand all of the effects from the Fukushima Dai-ichi event, and the agency will appropriately follow up on any new potential safety issues identified.

I want to express the NRC's appreciation for your interest in nuclear safety, and I look forward to your continued participation in the regulatory process.

Sincerely,

**/RA/**

Allison M. Macfarlane