August 21, 2013

Clark Vanderniet
Director of Regulatory Affairs
Transnuclear, Inc.
7135 Minstrel Way - Suite 300
Columbia, MD 21045

SUBJECT: INVITATION TO PARTICIPATE IN A PUBLIC MEETING TO DISCUSS ISSUES WITH SPENT FUEL VACUUM DRYING PROCESS

Dear Mr. Vanderniet:

This letter is to invite you to participate in a public meeting that the U.S. Nuclear Regulatory Commission (NRC) is conducting to discuss issues with the spent fuel vacuum drying system process with cask vendors. Vulnerabilities of the spent fuel vacuum drying system process were identified as a concern during an event that occurred at the Byron Station while performing spent fuel vacuum drying on August 28, 2010. During the drying process, the licensee suspended operations for the night and installed a chiller to remove heat. During the night, the chiller tripped. When the crew returned on the morning of August 29, the licensee realized the chiller had tripped. An NRC inspection was ongoing at that time and the NRC inspector inquired about the maximum temperature that the water in the annulus between the canister and the transfer cask had reached. The annulus water temperature is limited by the safety analysis report, because it impacts peak fuel cladding temperature. The chiller had been running for about one hour before temperature was taken. The cask vendor's analysis determined the spent fuel cladding temperature did not rise above the allowable limit. An Information Notice (IN) was issued on May 2, 2011 (IN-2011-10) to inform addressees about the incident and on January 2012, some informal questions were sent to the main cask vendors to inquire about any actions taken as a result of the IN. This event raised questions regarding the vacuum drying process. More specifically, the issues that have been identified are: What is the vulnerability of vacuum drying systems to failure modes that would allow air ingress into the canister (and what actions have been taken or proposed to date)? Are vacuum drying systems correctly categorized with regards to their significance to safety?

The staff's understanding of the process is that during vacuum drying, the canister is connected to a pump through a hose that could rupture allowing air ingress to the cavity. With spent fuel exposed to air, oxidation of fuel pellets or fuel fragments can occur if a cladding breach exists (pinholes or hairline cracks). Oxidation may occur rapidly and cause significant swelling of fuel pellets and fragments, which could result in gross fuel cladding breaches and release of fission products to the surrounding cask environment, if the time-at-elevated temperature after water removal is excessive. If oxidation of the UO_2 fuel pellets is sufficient to develop a gross breach, then sufficient U_3O_8 is formed to change the chemical form from that which was approved. Large cladding breaches could result in loss of retrievability and a configuration that has not been analyzed in the safety analysis report. Further, the release of fuel fines or grain-sized powder into the inner cask environment from ruptured fuel may be a condition outside the licensing basis for the cask system. During the event on August 29, 2010, the vacuum drying process may have been left unattended for an entire night. Staff's analysis indicated that the

peak cladding temperature could have exceeded the maximum temperature considered in NUREG-1536, indicating fuel oxidation and potential cladding failure in a matter of minutes if fuel assemblies were exposed to an unlimited supply of air as would be the case of an unattended hose breach. Safety analysis reports classify the vacuum drying system as not important to safety or fail to classify the system at all and therefore do not receive the same level of attention as those that are classified as important to safety.

The NRC is considering issuance of a generic communication to address these issues and is inviting the cask vendors to participate in a joint public meeting to discuss the vacuum drying process. Specifically, the NRC will discuss the issues in an open forum to understand how cask vendors would minimize the probability of a confinement boundary failure with subsequent air ingress at high temperatures or how they would address the generic issues described above. The NRC project managers will be contacting the cask vendors to set up a specific date for the public meeting.

If you have any questions about this letter please contact Jorge Solis, at (301) 287-9094 or by e-mail to Jorge.Solis@nrc.gov.

Sincerely,

/RA/

Mark Lombard, Director
Division of Spent Fuel Storage
and Transportation
Office of Nuclear Material Safety
and Safeguards

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