

June 2, 2005

MEMORANDUM TO: Leonard D. Wert, Jr., Director  
Division of Nuclear Materials Safety  
Region IV

FROM: Brian E. Thomas, Acting Deputy Director */RA/*  
Licensing and Inspection Directorate  
Spent Fuel Project Office  
Office of Nuclear Material Safety  
and Safeguards

SUBJECT: RESPONSE TO REGION IV's TECHNICAL ASSISTANCE REQUEST  
DATED MAY 5, 2004

This memorandum provides the Spent Fuel Project Office's response to Region-IV's Technical Assistance Request (TAR) dated May 5, 2004, from Elmo Collins to Charles Miller. In the TAR, Region-IV requested the Office of Nuclear Material Safety and Safeguards (NMSS) to provide technical assistance in addressing an unresolved item identified during the March 2004 inspection (Inspection Report 72-35/04-01, ML041140435) of the Columbia Independent Spent Fuel Storage Installation (ISFSI). During the inspection, the inspectors became aware that the licensee was conducting a required Technical Specification (TS) contamination survey of the upper portion of the loaded Multi-Purpose Canister (MPC) after the area had been decontaminated. Region-IV believes this survey should be conducted prior to decontamination.

Region-IV requested NMSS to provide an interpretation of TS 3.2.2 as to whether:

1. The only contamination survey required is of the upper portion of the MPC that was above the annulus seal and exposed to the spent fuel pool water after the transfer cask is decontaminated, or
2. A contamination survey under the annulus seal is also required before decontaminating that area, or
3. Contamination levels of the area under the annulus seal can be determined by alternate methods such as sampling the water in the annulus under the seal, or
4. Alternatively, review the need to have a TS limit for contamination when considering the risk to the public of a contaminated cask being placed on the ISFSI pad.

BACKGROUND:

Under the Certificate of Compliance (CoC) 72-1014, Amendment 1, TS 3.2.2 requires the exterior surface of the Transfer Cask (TC) and the accessible portions of the loaded MPC to be below a removable contamination limit of 1000 dpm/100 cm<sup>2</sup> beta gamma and 20 dpm/100 cm<sup>2</sup> alpha prior to transport to the ISFSI. The purpose of this TS is to ensure that radioactive contamination is not released to the environment and offsite dose limits are met once the

loaded MPC inside an overpack is placed on the ISFSI pad. Chapter 12 of the Final Safety Analysis Report (FSAR), Section B.3.2.2, discusses the need for this survey, however, no details are provided to address the location and number of surface swipes used to determine compliance with the TS. Instead, TS B.3.2.2 recommends that the plant-specific contamination measurement program for objects of this size be followed. Section B.3.2.2 of the TS also defines accessible portions of the MPC as the upper portion of the MPC external shell wall accessible after the inflatable annulus seal is removed and before the annulus shield ring is installed. The purpose of the inflatable annulus seal is to serve as an engineered barrier to prevent the intrusion of spent fuel pool water into the annulus between the MPC and TC when the MPC and TC are submerged in the spent fuel pool. The annulus is filled with plant demineralized water and the inflatable annulus seal is designed to prevent the contaminated spent fuel pool water from migrating into the annulus and mixing with the demineralized water.

#### EVALUATION:

Since the TC and the MPC are immersed in the spent fuel pool in order to load the spent fuel assemblies, the surfaces of the TC and MPC in direct contact with the spent fuel pool water may become contaminated with radioactive material. This contamination, on surfaces exposed to the environment, needs to be removed prior to moving the TC to the ISFSI or prior to transferring the MPC into an overpack, whichever occurs first, in order to minimize the potential of personnel or the environment from becoming contaminated. If the inflatable annulus seal functions as it is intended to, there should be no contamination in the annulus below the location of the inflatable annulus seal, but there may be some contamination in the upper region of the sealing surface of the inflatable annulus seal.

The areas currently surveyed by Columbia under TS 3.2.2 included the MPC lid and the upper portions of the MPC down to several inches below where the annulus seal had been installed. The clearance between the MPC and the TC walls is approximately 0.2 inches. The survey is conducted after all exterior surfaces of the TC and the accessible surfaces of the MPC have been decontaminated. An extra survey procedure adopted by Columbia is to take a sample of the water in the annulus gap below the seal to verify contamination levels below  $1 \times 10^{-6}$   $\mu\text{Ci/ml}$ . If the inflatable annulus seal functions as intended, these measures should be sufficient to ensure that no contamination is present.

Region-IV has questioned whether TS 3.2.2 requires that the survey of the accessible area under the annulus seal should be conducted prior to decontamination. If the annulus seal is not installed properly or degraded in some manner, and the accessible area prior to performing any decontamination is found to be contaminated above the TS removable contamination limits, this may indicate that the inaccessible portions of the MPC wall may be contaminated above the TS limit as well, and that the annulus gap area may need to be decontaminated before moving the MPC to the ISFSI pad. On the other hand, if the inflatable annulus seal functions properly, it is appropriate to perform contamination surveys of the accessible portions after the decontamination has been completed.

Past MPC loading experiences, at different sites as well as at Columbia (with their first MPC), have shown that contamination levels above the TS limits can be found under the annulus seal area, indicating that the inflatable annulus seal may not have been installed correctly, was

potentially degraded, and/or was not removed properly. That being the case, licensees need to either (1) ensure that the inflatable annulus seal is functioning as designed to prevent the entry of contaminated water into the annulus area, or (2) take other preventive and mitigative measures to ensure that any contamination that enters the annulus area is detected and removed prior to placing the cask on the ISFSI pad.

#### CONCLUSION:

Based on a review of TS 3.2.2 and its supporting bases, the applicable portions of the referenced inspection report, the background documents provided with the TAR, as well as similar operations at other Nuclear Regulatory Commission (NRC) licensed facilities, the staff finds that the timing of the contamination survey (i.e., completion of the survey either before or after decontamination) is not specified. Nonetheless, the timing of the survey should be dependent on ensuring that the underlying purpose of the TS is met (i.e., any residual contamination on the cask is within the limits approved for the design). Therefore, the timing of the contamination survey is dependent upon the ability of the licensee to ensure that the inflatable annulus seal functions as designed to prevent contamination from entering areas that were not evaluated in the approval of the dry cask system. In making this determination, the licensee should consider industry operational experience with these seals and the extent to which it is applicable to their site.

If the function of the inflatable annulus seal cannot be assured, one option to ensure contamination is not present in the annulus would be to survey the accessible area below the inflatable annulus seal prior to decontamination to determine whether spent fuel pool water was migrating past the seal. This is the method recommended and preferred by NRC staff based on the supporting documentation referenced in this response. In addition, sampling of the annulus water may provide an indicator of the contamination levels of the inaccessible areas of the MPC.

Alternatively, the Part 72 Certificate of Compliance holder for the affected dry cask storage systems may consider amending their designs to evaluate different removable surface contamination limits and the analyzed location of the contamination.

Although there was no violation of TS requirements on the part of the licensee, the underlying bases of the TS may not have been met due to the timing of the contamination survey and should be addressed by Columbia. As a result of the questions presented in your TAR NRC staff will endeavor to ensure that future TS sections addressing contamination surveys are clear and more precisely defined in the supporting bases.

This completes the Spent Fuel Project Office's response to your TAR. Please contact us if you have any further questions.

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