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0CAN101404

October 13, 2014

Attn: Document Control Desk  
Director, Spent Fuel Project Office  
Office of Nuclear Material Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:** Special Report – Dry Fuel Cask MPC-24-060  
Arkansas Nuclear One – Units 1 and 2  
Docket Nos. 50-313 and 50-368, and 72-13  
License Nos. DPR-51 and NPF-6

**REFERENCE:** 1. Entergy letter dated October 2, 2014, “Request for Exemption from Holtec International Certificate of Compliance (CoC) (72-1014) Fuel Specification and Loading Conditions” (0CAN101403) (ML14279A246, ML14279A247)

Dear Sir or Madam:

Per the requirements of the Holtec International Certificate of Compliance (CoC) (72-1014) for the HI-STORM 100 System, damaged fuel assemblies are not authorized for loading into the Model 24 Multi-Purpose Canister (MPC-24). However, on September 12, 2014, Arkansas Nuclear One (ANO) determined during cask drying operations for MPC-24-060 that a loaded fuel assembly previously classified as intact potentially contained one or more fuel rods with cladding damage greater than a pinhole leak or hairline crack. Subsequently, the fuel contained within the MPC was conservatively re-classified as damaged. The MPC was placed in a safe condition via completion of the drying, backfilling, and closure welding operations. The NRC Operations Center was notified of the event within 24 hours. The MPC remains in the Transfer Cask (HI-TRAC) in the Spent Fuel Pool (SFP) Cask Loading Pit work platform while an exemption request pursuant to 10 CFR 72.7, “Specific Exemptions” is being reviewed by the NRC (Reference 1). In accordance with Section 2.2.3 of the CoC, a Special Report is required to be submitted within 30 days, which is included in Attachment to this letter.

There are no new commitments contained in this submittal.

If you have any questions concerning this submittal or Entergy Operations storage of spent fuel under the general license, please contact me.

Sincerely,

**ORIGINAL SIGNED BY STEPHENIE L. PYLE**

SLP/jas/dbb

Attachment: Special Report – Dry Fuel Cask MPC-24-060

cc:

U.S. Nuclear Regulatory Commission  
Mr. Marc L. Dapas  
Regional Administrator, Region IV  
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U.S. Nuclear Regulatory Commission  
Ms. Andrea E. George  
MS O-8B1  
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Rockville, MD 20852

NRC Senior Resident Inspector  
Arkansas Nuclear One  
P. O. Box 310  
London, AR 72847

**Attachment to**

**0CAN101404**

**Special Report – Dry Fuel Cask MPC-24-060**

## **Special Report – Dry Fuel Cask MPC-24-060**

### **Cause of the violation:**

On September 12, 2014, an unanticipated Control Room Emergency Ventilation System (CREVS) actuation occurred at Arkansas Nuclear One (ANO). Follow-up investigation determined that sampling of helium circulating through a recently loaded dry fuel storage Multi-Purpose Canister (MPC) was the cause of the actuation. This canister (MPC-24-060) was loaded with ANO, Unit 1 (ANO-1) spent fuel. The helium is circulated through the MPC as part of the Forced Helium Dehydration process used in final stages of cask loading. The sample results determined the presence of Krypton-85 (Kr-85). Kr-85 is a fission product and indicates the potential for fuel rod leakage. All fuel assemblies loaded into MPC-24-060 were inspected subsequent to the respective final operating cycle to confirm the intact status of each (a cask Certificate of Compliance requirement). Intact fuel is fuel without known or suspected cladding defects greater than pinhole leaks or hairline cracks, and which can be handled by normal means. Each of the 24 fuel assemblies loaded into MPC-24-060 were determined to be intact based on either in-mast sipping or ultrasonic testing (UT) performed following the final respective operating cycle. A list of fuel assemblies having known leakage, pin donors, storage locations for leaking fuel pins, or otherwise in need of further evaluation prior to placement in dry storage is maintained in a comprehensive engineering report used to verify assembly status during cask fuel selection. References indicate that 13 of the 24 assemblies loaded into MPC-24-060 were from early cycles where grid to rod fretting was prevalent and in-mast sipping was not routinely performed during refueling. The 13 assemblies were screened by UT in 2008 (ten or more years after being removed from the core). Given the presence of Kr-85 in the MPC, the prevalence of grid-to-rod fretting in prior cycles (that typically produces defects larger than a pinhole leak or hairline crack) and that ultrasonic testing is only 94% accurate in identifying leaking fuel, it could not be concluded that the loaded fuel met the Certificate of Compliance (CoC) requirements for Fuel Specifications and Loading Conditions, relevant to an MPC-24. Because the size of the defect could not be determined based on UT and visual examinations performed, the defects were conservatively re-classified to be greater than a pinhole leak or hairline crack.

An Apparent Cause Evaluation (ACE) was performed for this condition. The ACE determined there were two potential causes. The first (and most likely) apparent cause of the event is that the three standard methods used throughout the nuclear industry to detect fuel failures have been shown to be less than 100% accurate. These three methods (in-mast sipping, UT, and vacuum sipping) are currently the best available technology to detect fuel failures. Either in-mast sipping or UT performed on the fuel assembly with an assumed grid-to-rod fretting failure did not detect the failure. Therefore, the fuel assembly was determined to be intact and subsequently loaded into MPC-24-060.

The least accurate of these methods is UT. UT was utilized for thirteen of the twenty-four fuel assemblies loaded into MPC-24-060 to determine if fuel failures were present. The most likely scenario is that one of the thirteen fuel assemblies was failed and the UT was not successful in detecting the condition.

The second (and less likely) apparent cause of the event is that the fuel failure occurred during depressurization of the MPC. This scenario is unlikely to occur due to the small amount of pressure change during the Forced Helium Dehydration process. The fuel cladding is designed

to withstand normal external pressure ranging from about 0 to 2200 psig (operation) and contains an internal pressure as high as 1500 psig in the SFP (freshly discharged). Because of the small likelihood of this scenario occurring, no corrective actions were recommended for this apparent cause.

**Corrective steps that have been taken:**

In accordance with Appendix B, Section 2.1 of the Holtec CoC, "Fuel Specifications and Loading Conditions," the affected fuel assembly was verified to be in a safe condition. An assessment of the effect a damaged rod would have on the storage configuration of a fuel assembly in the HI-STORM 100 system considering the normal, off-normal, and accident conditions was performed. Based on this assessment, loading damaged fuel assemblies in MPC-24-060 resulted in no impact to safety, and all functions of the Dry Fuel Storage (DFS) cask system are maintained. The MPC remains in the HI-TRAC located in the ANO-1 Cask Loading Pit Work Platform. The drying, backfill process, and final closure welding have been completed on the MPC.

This assessment did not consider the requirements for the MPC to be transported off-site. Pursuant to 10 CFR 71.87(a), prior to transport a licensee must verify the contents are appropriate for the transport packaging. Damaged fuel may not be authorized as approved contents for transportation in the MPC-24 by the CoC. ANO maintains detailed records, available for inspection, to ensure transport regulations are met. The specific serial numbered MPC involved has been identified as containing damaged fuel.

**Corrective steps that will be taken to avoid further violations:**

The following actions are captured in Condition Report CR-ANO-1-2014-1484.

A list of remaining SFP fuel assemblies that operated in suspect cycles which were not tested through in-mast sipping during the respective final refueling discharge will be developed. This action is intended to address the potential for recurrence by strengthening the barrier designed to prevent loading of failed fuel.

MPC-24-060 will be added to the list of DFS casks that contain fuel assemblies with potentially leaking fuel pins. These casks are currently not suitable for shipment without further evaluation.

**Date when full compliance will be achieved:**

While loading of the damaged fuel into a MPC-24 is not permitted by the CoC, Entergy believes unloading MPC-24-060 to restore compliance is not prudent. Rather, an exemption has been submitted to the NRC requesting that MPC-24-060, as loaded, be placed in onsite storage. Unloading the subject MPC would subject personnel to a significant amount of unnecessary dose, generate additional contaminated waste, increase the risk of a possible fuel handling accident, and increase the risk of a possible heavy load handling accident.

Full compliance is expected to be achieved upon the NRC's approval of the subject exemption (reference 0CAN101403, dated October 2, 2014, ML14279A246 and ML14279A247).