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10CFR2.201

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Subject: Arkansas Nuclear One - Unit 2  
Docket No. 50-368  
License No. NPF-6  
Response To Inspection Report  
50-313/97-03; 50-368/97-03

Gentlemen:

Pursuant to the provisions of 10CFR2.201, attached is the response to the notice of violation identified during the inspection activities associated with the placement of a fuel assembly in a location in the spent fuel pool which was prohibited by technical specifications.

Should you have any questions or comments, please call me at 501-858-4601.

Very truly yours,

Dwight C. Mims  
Director, Nuclear Safety

DCM/ajs

Attachments

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## NOTICE OF VIOLATION

During an NRC inspection conducted on April 27 through June 7, 1997, two violations of NRC requirements were identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violations are listed below:

- A. The information regarding the reason for the violation and the corrective actions to correct the violation and prevent recurrence are addressed in Licensee Event Report 50-368/97-002-00. No response is required to this violation.
- B. Technical Specification 6.8.1 states, in part, that written procedures be established, implemented, and maintained covering the activities for both refueling operations and for new and spent fuel storage.

1. Procedure 1022.012, Revision 18, "Storage, Control & Accountability of Special Nuclear Material," Step 6.3.1, requires, prior to movement of fuel assemblies to the spent fuel pool, that two qualified individuals perform independent reviews to determine the classification of fuel assemblies using Attachment 5 of the procedure and documenting the results on Form 1022.012U, "Unit 2 Nuclear Fuel Location Record." Procedure 1022.012, Attachment 5, Step 2.0, used to calculate fuel assembly average burnup, requires that an adjustment factor of 0.93 be applied to the measured fuel assembly burnup to account for measurement uncertainties.

Contrary to the above, a reactor engineer failed to apply the adjustment factor to the measured fuel assembly burnup when calculating the average burnup for the fuel assemblies to be offloaded from the reactor vessel to the spent fuel pool and did not document the results on Form 1022.012U. As a result, 42 of 177 fuel assemblies were classified incorrectly, resulting in one fuel assembly being placed in a spent fuel pool location prohibited by Technical Specifications.

2. Procedure 1022.012, Revision 18, "Storage, Control & Accountability of Special Nuclear Material," Step 6.3.1, requires, prior to movement of fuel assemblies to the spent fuel pool, that two qualified individuals perform independent reviews to determine the classification of fuel assemblies.

Contrary to the above, an independent review to determine the classification of fuel assemblies was not performed prior to the movement of fuel from the reactor vessel to the spent fuel pool on May 18, 1997.

3. Procedure 1022.012, Revision 18, "Storage, Control & Accountability of Special Nuclear Material," Step 6.3.4, requires, that Form 1022.012B, "Nuclear Fuel Transfer Report," be independently reviewed by a qualified individual to verify special nuclear material storage in locations in compliance with Steps 6.3.1, 6.3.2, and 6.3.3.

Contrary to the above, the independent reviewer failed to verify compliance with Steps 6.3.1 and 6.3.2 in that Form 1022.012Us were not reviewed.

This is a Severity Level IV violation (Supplement 1) (Violation 50-368/9703-04).

Response to Notice Of Violation 313/9702-01; 368/9702-01

(1) Reason for the violation:

Storage locations in the ANO-2 spent fuel pool (SFP) are restricted based on initial fuel enrichment and fuel assembly average burnup. Procedure 1022.012, *Storage, Control & Accountability of Special Nuclear Material*, provides instructions to calculate and document the restriction classification for fuel assemblies to be stored in the SFP. A burnup adjustment factor of 0.93 is used to account for measurement uncertainties in the measured fuel assembly burnup.

Procedure 1022.012 was revised on March 1, 1997, due to a change to the ANO-2 Technical Specifications allowing storage of fuel with enrichments as high as 5.0 weight percent. This revision increased the number of restriction categories from two to four. The first opportunity to use the new procedure to classify fuel assemblies was when the new fuel arrived in preparation for the 2R12 refueling outage. A spreadsheet was developed to perform the multiple calculations for classifying the new fuel assemblies. No burnup adjustment factor was applied to the calculation since the new assemblies had no burnup.

The same spreadsheet was used a second time when end of cycle burnup projections were calculated for an advance determination of the fuel shuffle sequence. Before the fuel shuffle sequence can be completed the fuel assemblies in the reactor core must be classified to determine an appropriate SFP location for each assembly. The spreadsheet was used but an independent calculation was not required. Thus, the missing burnup adjustment factor was not detected.

Once the reactor shutdown was completed, the actual end of cycle burnup was calculated. Again, the spreadsheet developed previously was used to determine the classification of the fuel assemblies. Since the results compared favorably with the end of cycle projections, one individual was assigned to update the fuel location records while another was completing the fuel shuffle sequence report. Procedure 1022.012 requires that, prior to movement of fuel to the SFP, two qualified individuals perform

independent reviews to determine the restriction classification of the fuel assemblies and document the results on form 1022.012U, *Unit 2 Nuclear Fuel Location Record*. The sequence report was completed but the independent check for classification did not occur prior to the report being delivered to the control room for use. The independent reviewer for the fuel shuffle sequence report signed form 1022.012B the *Nuclear Fuel Transfer Report* without having consulted form 1022.012U *Unit 2 Nuclear Fuel Location Record*.

Approximately one hour before the start of the core off-load, the Reactor Engineering Superintendent discovered the fuel location record forms with the independent review unsigned. Knowing the fuel shuffle sequence report was completed, he assumed the absence of a second signature was just an administrative oversight and that the independent reviews had been completed. However, to ensure that they were in fact completed and properly documented, a day shift individual was assigned to perform the second calculations. The superintendent believed these calculations could be completed expeditiously in the sequence of the off-load, thereby completing the required documentation before each specific move.

Due to support of other core off-load activities, the second calculations were delayed and not started until after fuel movement had commenced. A night shift individual discovered his calculations were not correlating with the first results and identified that the initial calculation did not include the burnup adjustment factor. When the error was verified, all fuel movement was stopped. A total of seven fuel assemblies had been moved into the SFP, but only one assembly was found to be inappropriately located. An allowed storage location for this assembly was identified and it was relocated to the new location.

Subsequent calculations determined that 42 of the 177 fuel assemblies had been assigned the wrong classification due to the error in the original calculation. Had the error not been detected, 14 of these misclassified assemblies would have been placed in inappropriate locations. The other 28 fuel assemblies, although originally misclassified, were destined for allowable storage locations in the original fuel shuffle sequence.

Two root causes were identified for this event. First, was the failure to follow the procedural guidance. Attachment 5 to procedure 1022.012 provides instruction for conservatively calculating the fuel assembly burnup to account for uncertainties associated with power measurements and power distribution. The individual who prepared the, form 1022.012U, failed to utilize this procedural guidance to determine the adjusted fuel assembly burnup. Second, was the failure to perform a proper second person verification when the independent reviewer signed the *Nuclear Fuel Transfer Report*, form 1022.012B, without having consulted form 1022.012U *Unit 2 Nuclear Fuel Location Record*.

(2) Corrective steps that have been taken and the results achieved:

The misplaced fuel assembly was relocated to its proper SFP region.

A complete recalculation for all fuel assemblies to be off-loaded from the core was performed to verify that the assemblies were correctly classified. A second calculation was performed independently to verify the results of the first calculation. Additionally, two other individuals performed independent calculations on randomly selected assemblies to verify agreement with the first calculation.

Reviews were conducted of the ANO-1 SFP and the ANO-2 SFP to ensure the fuel is stored in the correct regions. No deficiencies were identified.

Briefings were conducted with Reactor and System Engineers to discuss the management expectations concerning the performance of independent reviews.

Prior to recommencing fuel handling operations both the ANO-2 System Engineering Manager and the ANO-2 Plant Manager were briefed on the event and the corrective actions taken.

An evaluation was made of the ANO-2 SFP for a complete off-load of the cycle 12 core in the originally designated locations. This evaluation concluded that K-effective would have been maintained below the licensing basis analysis value even with the assumption of 0 ppm boron in the SFP.

(3) Corrective steps that will be taken to avoid further violations:

Improvements in Job Specific Training to specifically address fuel moves will be evaluated and identified changes will be implemented for Reactor Engineers by June 30, 1998.

Expectations for procedure usage and independent reviews for Reactor, System, Design, and Maintenance Engineers will be documented and communicated to the appropriate personnel by December 19, 1997.

Lessons learned from this event will be evaluated and included in appropriate departmental continuing training by December 19, 1997.

Procedure 1022.012 will be revised by December 19, 1997, to incorporate place-keeping and appropriate cautions to address this condition.

(4) Date when full compliance will be achieved:

Full compliance was achieved on May 19, 1997, when the inappropriately positioned fuel assembly was relocated to an allowed storage location and the fuel classification calculations were correctly reperformed and independently verified.