October 24, 2000

Mr. Craig G. Anderson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 2 - ISSUANCE OF AMENDMENT RE: TECHNICAL SPECIFICATION REVISION ASSOCIATED WITH REGION 1 OF THE SPENT FUEL POOL (TAC NO. MA9727)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 224 to Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit No. 2 (ANO-2). This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated August 10, 2000.

The amendment revises the TSs to allow an alternate storage configuration of fuel assemblies adjacent to the walls within Region 1 of the spent fuel pool.

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Thomas W. Alexion, Project Manager, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosures:
1. Amendment No. 224 to NPF-6
2. Safety Evaluation

cc w/encls: See next page

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Arkansas Nuclear One

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 224
License No. NPF-6

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee), dated August 10, 2000, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-6 is hereby amended to read as follows:

   2. Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 224 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. The license amendment is effective as of its date of issuance and shall be implemented within 60 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A Gramm

Robert A. Gramm, Chief, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: October 24, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 224

FACILITY OPERATING LICENSE NO. NPF-6

DOCKET NO. 50-368

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
3/4 9-14	3/4 9-14
B 3/4 9-3	B 3/4 9-3

REFUELING OPERATIONS

FUEL STORAGE

LIMITING CONDITION FOR OPERATION

3.9.12.a Storage in the spent fuel pool shall be restricted to fuel assemblies having initial enrichment less than or equal to 5.0 w/o U-235. The provisions of Specification 3.0.3 are not applicable.

3.9.12.b Storage in Region 1 or Region 2 (as shown on Figure 3.9.1) of the spent fuel pool shall be further restricted by the limits specified in Figure 3.9.2. In the event a cross-hatch storage configuration is deemed necessary for a portion of either Region 1 or Region 2, vacant spaces diagonal to the four corners of any fuel assembly or vacant spaces on two opposite faces of any fuel assembly shall be physically blocked before any such fuel assembly may be placed in that region (Note 1). Also, the Region 1 storage cells adjacent to the Region 2 interface are restricted to fuel assemblies that are outside of the area of the graph enclosed by Curve A on Figure 3.9.2. In the event a checkerboard storage configuration is deemed necessary for a portion of Region 2, vacant spaces adjacent to the four faces of any fuel assembly shall be physically blocked before any such fuel assembly may be placed in Region 2. The provisions of Specification 3.0.3 are not applicable.

3.9.12.c The boron concentration in the spent fuel pool shall be maintained (at all times) at greater than 1600 parts per million.

APPLICABILITY: During storage of fuel in the spent fuel pool.

ACTION:

Suspend all actions involving the movement of fuel in the spent fuel pool if it is determined a fuel assembly has been placed in an incorrect location until such time as the correct storage location is determined. Move the assembly to its correct location before resumption of any other fuel movement.

Suspend all actions involving the movement of fuel in the spent fuel pool if it is determined the pool boron concentration is less than 1601 ppm, until such time as the boron concentration is increased to 1601 ppm or greater.

SURVEILLANCE REQUIREMENTS

4.9.12.a Verify all fuel assemblies to be placed in the spent fuel pool have an initial enrichment of less than or equal to 5.0 w/o U-235 by checking the assemblies' design documentation.

4.9.12.b Verify all fuel assemblies to be placed in the spent fuel pool are within the limits of Figure 3.9.2 by checking the assemblies' design and burnup documentation.

4.9.12.c Verify at least once per 31 days the spent fuel pool boron concentration is greater than 1600 ppm.

Note 1: If the most peripheral row/column of the Region I contains vacant spaces in a cross-hatch storage configuration, these vacant spaces may be filled with fuel assemblies that are outside of the area of the graph enclosed by Curve A on Figure 3.9.2, provided that the most southwest and southeast corner locations remain empty.

3/4.9.9 and 3/4.9.10 WATER LEVEL-REACTOR VESSEL AND SPENT FUEL POOL WATER LEVEL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 12% iodine gap activity released from the rupture of an irradiated fuel assembly. The minimum water depth is consistent with the assumptions of the accident analysis.

3/4.9.11 FUEL HANDLING AREA VENTILATION SYSTEM

The limitations on the fuel handling area ventilation system ensure that all radioactive materials released from an irradiated fuel assembly will be filtered through the HEPA filters and charcoal adsorbers prior to discharge to the atmosphere. The operation of this system and the resulting iodine removal capacity are consistent with the assumptions of the accident analyses.

3/4.9.12 FUEL STORAGE

Region 1 and Region 2 of the spent fuel storage racks are designed to assure fuel assemblies of less than or equal to 5.0 w/o U-235 enrichment that are within the limits of Figure 3.9.2 will be maintained in a subcritical array with $K_{eff} \leq 0.95$ in unborated water. These conditions have been verified by criticality analyses.

The requirement for 1600 ppm boron concentration is to assure the fuel assemblies will be maintained in a subcritical array with $K_{eff} \leq 0.95$ in the event of a postulated accident. Analysis has shown that, during a postulated accident with the fuel stored within the limits of this specification, that a K_{eff} of ≤ 0.95 will be maintained when the boron concentration is at or above 1000 ppm.

Normally, fuel stored in a cross-hatch storage configuration must have all four diagonal spaces or at least two adjacent faces remain vacant to meet the criticality safety analysis mentioned above. However, the spent fuel pool walls may be credited as a neutron leakage path. Therefore, vacant spaces face adjacent to the walls of the Region I cross-hatch configured assemblies may be used to store fuel assemblies that are outside of the area of the graph enclosed by Curve A on Figure 3.9.2, excluding the most southeast and southwest corner spaces of Region 1 which must remain empty.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 224 TO

FACILITY OPERATING LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By letter dated August 10, 2000, Entergy Operations, Inc. (the licensee), submitted a request for changes to the Arkansas Nuclear One, Unit No. 2 (ANO-2), Technical Specifications (TSs). The requested changes would revise the TSs to allow an alternate storage configuration of fuel assemblies adjacent to the walls within Region 1 of the spent fuel pool (SFP).

2.0 BACKGROUND

The ANO-2 spent fuel storage pool provides storage locations for 988 spent fuel assemblies. The pool contains four modules with a 9x9 array of fuel assembly storage cells, four modules with a 9x10 array of cells, two modules with an 8x10 array of cells, and two modules with an 8x9 array of cells. Two of the 9x9 and one of the 8x9 arrays located on the southern-most end of the SFP are referred to as Region 1. The remaining arrays are referred to as Region 2.

Fuel storage in Region 1 or Region 2 is restricted by the limits specified in TS Figure 3.9.2. In the event a cross-hatch storage configuration is deemed necessary for a portion of either Region 1 or Region 2, vacant spaces diagonal to the four corners of any fuel assembly or vacant spaces on two opposite faces of any fuel assembly must be physically blocked before an assembly may be placed in that region. Credit for fuel assembly burnup was used to allow storage of assemblies with enrichments up to 5.0 w/o U-235. The allowable burnup versus initial enrichment (in terms of average U-235 loading per unit length) is shown in TS Figure 3.9.2. Note the upper limit of 0.614 gm U-235 per inch is equivalent to 5.0 w/o U-235. The following revisions are proposed for storage in Region 1, as paraphrased by the staff:

> Limiting Condition for Operation (LCO) 3.9.12.b would be revised to include a "Note 1" in reference to the statement that requires applicable vacant spaces around cross-hatch configured assemblies to be physically blocked. Note 1 would be added at the bottom of this page (Page 3/4 9-14). The note would provide restrictions regarding when vacant spaces adjacent to the SFP walls of Region 1 may be used for fuel storage instead of being physically blocked. In addition, the bases page (Page B 3/4 9-3) would be revised to describe the proposed LCO change.

The staff's evaluation of the criticality aspects of the proposed enrichment increase follows.

3.0 EVALUATION

The current criticality safety analysis, which requires fuel to be stored in a cross-hatch configuration, results in several vacant spaces along the Region 1 walls of the SFP. This analysis was based upon infinite assembly array calculations and did not credit radial neutron leakage effects. Since this analysis, additional fuel assemblies have been discharged and stored in the SFP, resulting in reduced SFP storage capacity. Following the ANO-2 refueling outage scheduled for September 2000, there will not be sufficient storage capacity for future full core offloads. Therefore, the licensee has performed an evaluation to support storing fuel assemblies along the periphery of Region 1 adjacent to the walls. The new evaluation extends the current analysis to include additional storage configuration options. All computer codes, fuel assembly data, spectral history effects, reactivity equivalence considerations, biases and uncertainties, Boraflex gapping or shrinkage, and Region 1/Region 2 interface considerations remain identical to those in the previous analysis. The new criticality safety evaluation, however, modifies the KENO model from an infinite array to a model that includes the SFP wall as a boundary condition.

The Nuclear Regulatory Commission (NRC) acceptance criterion for preventing criticality in the SFP, including uncertainties, is that there is a 95 percent probability at a 95 percent confidence level (95/95 probability/confidence) that the effective neutron multiplication factor (k_{eff}) of the fuel assembly array will be no greater than 0.95 in unborated water. The extended Region 1 analysis assumes a rack-to-wall gap of 6.0 inches on the west and east sides of the SFP and 5.13 inches on the south end of the SFP. The SFP walls are modeled as 4-foot thick concrete slabs. For conservatism, the neutron absorption characteristics of the steel pool liner are removed from the modeling. The analysis, assuming that vacant spaces in a cross-hatch storage configuration in Region 1 are filled with fuel assemblies that are outside of the area of the graph enclosed by Curve A (less reactive) on TS Figure 3.9.2, results in a 95/95k_{eff} of 0.9493 in unborated water, thus meeting the staff's acceptance criterion. However, the southwest and southeast corner locations of Region 1 must remain empty and physically blocked when this configuration is employed.

For accident considerations, the accidental placement of a fresh 5.0 w/o U-235 assembly into a cell location on a peripheral row or column of the Region 1 rack that is face-adjacent to the SFP walls would result in the highest reactivity increase. For this event, k_{eff} would remain well below 0.95 with 1600 ppm of soluble boron in the pool, as required by TS 3.9.12.c. For accident conditions, at least two unlikely, independent, concurrent events are required in order to have a criticality event (double contingency principle). Therefore, credit for 1600 ppm of boron may be assumed for a misloading accident, since its absence would constitute a second unlikely, independent, concurrent event. The new analysis, in fact, indicates that only 1000 ppm of boron is more than sufficient to maintain k_{eff} well below 0.95.

Based on the above evaluation, the staff finds the proposed change to TS 3.9.12 acceptable. The change would add a Note 1 to TS 3.9.12.b stating that "If the most peripheral row/column of the Region 1 contains vacant spaces in a cross-hatch storage configuration, these vacant spaces may be filled with fuel assemblies that are outside of the area of the graph enclosed by Curve A on Figure 3.9.2, provided that the most southwest and southeast corner locations remain empty."

4.0 EVALUATION SUMMARY

Based on the review described above, the staff finds the proposed revision to ANO-2 TS 3.9.12.b, to allow an alternate storage configuration of fuel assemblies adjacent to the walls within Region 1 of the SFP provided they are less reactive than the area of the graph enclosed by Curve A on TS Figure 3.9.2, acceptable. This will provide up to 17 additional storage locations.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arkansas State official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (65 FR 54086, dated September 6, 2000). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: L. Kopp

Date: October 24, 2000