September 3, 2003

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: REVISED SPENT FUEL POOL LOADING PATTERN (TAC NO. MB9758)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 250 to Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit No. 2. This amendment consists of changes to the Technical Specifications in response to your application dated June 30, 2003, as supplemented by letters dated August 1 and 12, 2003.

The amendment (1) eliminates credit for the Boraflex neutron absorbing material used for reactivity control in Region 1 of the spent fuel pool (SFP), (2) credits a combination of soluble boron and several defined fuel loading patterns within the storage racks to maintain SFP reactivity within the effective neutron multiplication factor (K_{eff}) limits of 10 CFR 50.68, (3) increases the minimum boron concentration in the SFP to greater than 2000 parts per million, and (4) reduces the fresh fuel assembly initial enrichment to less than or equal to 4.55 ± 0.05 weight percent uranium-235.

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
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosures: 1. Amendment No. 250 to NPF-6
2. Safety Evaluation

cc w/encls: See next page

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ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 250
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 June 30, 2003, as supplemented by letters dated August 1 and 12, 2003, 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) <u>Technical Specifications</u>

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 250, 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 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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

Attachment: Changes to the Technical Specifications

Date of Issuance: September 3, 2003

ATTACHMENT TO LICENSE AMENDMENT NO. 250

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
3/4 9-15	3/4 9-15
3/4 9-16	3/4 9-16
---	3/4 9-17
---	3/4 9-18
---	3/4 9-19
---	3/4 9-20
---	3/4 9-21
5-2	5-2

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 250 TO

FACILITY OPERATING LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By application dated June 30, 2003, as supplemented by letters dated August 1 and 12, 2003, Entergy Operations, Inc. (the licensee), requested changes to the Technical Specifications (TSs) for Arkansas Nuclear One, Unit No. 2 (ANO-2). The supplements dated August 1 and 12, 2003, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on July 22, 2003 (68 FR 43384).

The proposed changes would (1) eliminate credit for the Boraflex neutron absorbing material used for reactivity control in Region 1 of the spent fuel pool (SFP), (2) credit a combination of soluble boron and several defined fuel loading patterns within the storage racks to maintain SFP reactivity within the effective neutron multiplication factor (K_{eff}) limits of 10 CFR 50.68, (3) increase the minimum boron concentration in the SFP to greater than 2000 parts per million (ppm), and (4) reduce the fresh fuel assembly initial enrichment to less than or equal to 4.55 ± 0.05 weight percent (wt%) uranium-235 (U-235). The licensee needs these changes to support a full core offload during the ANO-2 fall 2003 refueling outage.

The ANO-2 TSs currently permit the licensee to store 988 fuel assemblies in the SFP in two regions, Region 1 and Region 2. The licensee uses 12 stainless steel storage racks in two regions to hold the assemblies. Region 1 contains Boraflex, which has degraded below the original analytical assumptions. Region 2 does not contain Boraflex material. Boraflex was originally used to augment reactivity control. The principal fabrication materials are American Society for Testing and Materials A240, Type 304 stainless steel for the structural members and shapes. In the application, the licensee has chosen to remove all references to Region 1 and 2 and to treat the SFP as one region.

Since the early 1990s, the U.S. Nuclear Regulatory Commission (NRC) and the nuclear power industry have been aware of degradation problems related to Boraflex panel inserts used in nuclear power plants' SFPs. In 1996, the NRC published Generic Letter (GL) 96-04, "Boraflex Degradation in Spent Fuel Pool Storage Racks." This generic letter provided the information describing the degradation mechanism and requested information from all nuclear power plant operating license holders regarding the condition of the Boraflex in the SFPs. The staff requested licensees that use Boraflex to assess the ability of Boraflex to maintain a K_{eff} of 0.95, and to submit a plan describing actions required if the five percent margin to criticality could not be maintained by Boraflex material due to current or projected material degradation. Since the issuance of GL 96-04, most plants have developed other means of ensuring subcriticality in the SFP such as different neutron absorbing rack inserts, restrictive rack storage configurations, and soluble boron credits.

To eliminate its dependence on the degrading Boraflex panel inserts at ANO-2, the licensee proposed to not credit Boraflex in the criticality calculations for any of the proposed storage patterns.

2.0 REGULATORY EVALUATION

2.1 Regulatory Requirements

(a) Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50 Appendix A, "General Design Criteria [GDC] for Nuclear Power Plants," provides the minimum design requirements for nuclear power plants. According to GDC 62, "Prevention of criticality in fuel storage and handling," the licensee must limit the potential for criticality in the fuel handling and storage system by physical systems or processes. The staff reviewed the amendment request to ensure that the licensee complied with GDC 62.

(b) Provided in 10 CFR Section 50.68, "Criticality accident requirements," are the NRC regulatory requirements for maintaining subcritical conditions in SFPs. Since the licensee currently uses 10 CFR 50.68 as the licensing basis for its SFP, the staff has reviewed the proposed changes against the appropriate parts of the section. The acceptance criteria are described in Section 3.0 below.

3.0 TECHNICAL EVALUATION

The ANO-2 spent fuel storage racks were analyzed by the Holtec Corporation (Holtec) and documented in the Holtec report HI-2033026 (Attachment 5 of the June 30, 2003, application). The methodology described in the Holtec report takes partial credit for soluble boron in the SFP criticality analyses and requires conformance with the following NRC acceptance criteria for preventing criticality outside the reactor:

(a) The K_{eff} shall be less than 1.0 if fully flooded with unborated water, which includes an allowance for uncertainties at a 95 percent probability, 95 percent confidence (95/95) level; and

(b) K_{eff} shall be less than or equal to 0.95 if fully flooded with borated water, which includes an allowance for uncertainties at a 95/95 level.

The NRC defined acceptable methodologies for performing SFP criticality analyses are provided in two documents:

(a) Proposed Revision 2 to Regulatory Guide (RG) 1.13, "Spent Fuel Storage Facility Design Basis," and

(b) Memorandum from L. Kopp (NRC) to T. Collins (NRC), “Guidance on the Regulatory Requirements for Criticality Analysis of Fuel Storage at Light-Water Reactor Power Plants,” dated August 19, 1998.

In determining the acceptability of the licensee's amendment request, the staff reviewed three aspects of the licensee’s analyses: 1) the computer codes employed, 2) the methodology used to calculate the maximum K_{eff}, and 3) the storage configurations and limitations proposed. For each part of the review, the staff evaluated whether the licensee’s analyses and methodologies provided reasonable assurance that adequate safety margins in accordance with NRC regulations were developed and could be maintained in the ANO-2 SFP.

3.1 Computer Codes

The licensee performed the analysis of the reactivity effects for the ANO-2 SFP racks with the MCNP4a code, a continuous energy three-dimensional Monte Carlo code. The MCNP4a code was benchmarked against criticality experiments and the KENO-5a code under conditions which bound the range of variables in the ANO-2 rack designs. The critical benchmark experiments considered the effects of varying fuel enrichment, Boron-10 loading, lattice spacing, fuel pellet diameter, and soluble boron concentration. The experimental data are sufficiently diverse to establish that the method bias and uncertainty will apply to the ANO-2 storage rack conditions. The licensee determined that the MCNP4a code calculational (methodology) bias is 0.0009 with a 95/95 bias uncertainty of +/- 0.0011. The MCNP4a values strongly correlate to those predicted by the KENO5a code using the same critical benchmark experiments.

In addition to using the MCNP4a code to perform the criticality analyses, the licensee employed the CASMO-4 code to perform the fuel depletion analyses. The licensee used this two-dimensional multigroup transport theory code to determine the isotopic composition of the spent fuel and determine the reactivity effect of the fuel, rack, and control element assembly (CEA) tolerances. From this code, the licensee determined the reactivity effect (delta-K) for each manufacturing tolerance of the fuel assemblies and storage racks.

The staff reviewed the licensee’s application of the codes to determine whether each could reasonably calculate the appropriate parameters necessary to support the maximum K_{eff} analyses. The staff concludes that the licensee’s use of the MCNP4a code for calculation of the nominal K_{eff} is appropriate since it was benchmarked against experimental data which bound the proposed assembly and rack conditions for the ANO-2 SFP. Additionally, the staff finds that the licensee’s use of the CASMO-4 code is acceptable for determining the delta-K for each manufacturing tolerance and for performing the fuel depletion analyses.

3.2 Methodology

In accordance with the guidance contained in the proposed Revision 2 to RG 1.13 and the L. Kopp memorandum dated August 19, 1998, the licensee performed criticality analyses of its SFP. The licensee employed a methodology that combines a worst-case analysis based on the bounding fuel, rack, and CEA conditions, with a sensitivity study using 95/95 analysis techniques. The major components in this analysis were a calculated K_{eff} based on the limiting fuel assembly, code biases, and a statistical sum of 95/95 uncertainties and worst-case delta-K manufacturing tolerances.

In performing its criticality analysis, the licensee first calculated a K_{eff} based on nominal core conditions using the MCNP4a code. The licensee determined this K_{eff} from the limiting (highest reactivity) fuel assemblies stored in the SFP. The licensee performed its reactivity analyses for various enrichments, cooling times, burnups, and the bounding cladding thicknesses. In performing these calculations, the licensee assumed appropriately conservative conditions, such as an infinite radial array. The Combustion Engineering 16x16 assembly served as the nominal assembly for all calculations that the licensee performed in its respective SFP region.

To the calculated K_{eff}, the licensee added the methodology bias as well as a reactivity bias to account for the effect of the normal allowable range of SFP water temperatures. As stated in the description of the MCNP4a code, the licensee determined the methodology bias from the criticality benchmark experiments. For each of the proposed storage configurations, the licensee analyzed the reactivity effects of the SFP water temperature. For assemblies with and without CEAs, the licensee determined the SFP temperature coefficient of reactivity. The licensee also calculated the reactivity bias associated with a temperature decrease to the maximum density of water, typically at 4°Centigrade.

Finally, to determine the maximum K_{eff}, the licensee performed a statistical combination of the uncertainties, including MCNP4a bias uncertainties and manufacturing tolerances. The licensee determined both of these uncertainties to a 95/95 threshold, which is consistent with the requirements of 10 CFR 50.68. In the August 1, 2003, supplemental letter, the licensee provided, at the request of the staff, a comprehensive list of the manufacturing tolerances considered. For each tolerance, the licensee used the CASMO-4 code to calculate a delta-K between the nominal condition and the most limiting tolerance condition. By using the most limiting tolerance condition, the licensee calculated the highest reactivity effect possible. This results in a conservative margin since the tolerances will always bound the actual parameters. Once the reactivity effects for each of the tolerances were determined, the licensee statistically combined each of the manufacturing tolerances with the 95/95 uncertainties. The staff reviewed the licensee's methodology for calculating the reactivity effects associated with the uncertainties and manufacturing tolerances, as well as the statistical methods used to combine these values. The staff finds the licensee's methods conservative and acceptable.

3.3 Proposed Storage Configurations

The primary purpose of the licensee's amendment request was to gain the staff's approval for new storage configurations within the SFP storage racks. The licensee-proposed storage configurations are divided into five permissible (2 by 2) storage patterns based on nine fuel assembly rankings. Proposed TS Figure 3.9-2 depicts each of the patterns and provides the limitations for each. Additionally, the figure describes the allowable rack interface alignments, fresh fuel storage configurations, wall-interface storage patterns, and inter-rack storage limitation requirements.

The licensee's proposed storage patterns require proper classification of spent fuel assemblies into nine rankings based on initial enrichment, burnup, and cooling time. Table 1.1 of the Holtec report, which references other tables, provides numerical data used to calculate the minimum burnup as a function of initial enrichment and cooling time. The licensee classifies each fuel type based on its ability to meet the three requirements (enrichment, burnup, and cooling time) in the tables. To demonstrate the acceptability of the data presented in the tables, the licensee performed numerous confirmatory calculations based on the tabular values. The results showed that the K_{eff} was less than 1.0 in all cases without crediting soluble boron. Additionally, the confirmatory calculations, in combination with the conservative assumptions, ensure that the results bound the actual variance in conditions found in the SFP.

The licensee calculates fuel assembly burnup for core reloads based on predicted in-core power distributions. The licensee will use the same techniques for calculation of assembly burnup to meet the proposed SFP restrictions. Since the licensee will use the same techniques for calculating assembly burnup for the SFP as those used in core reload analyses that have previously been reviewed and approved by the staff, the staff finds this approach acceptable for ensuring minimum burnup limits are met.

In addition to crediting fuel assembly burnup, the licensee has proposed to credit the cooling time for fuel assemblies. The licensee's cooling time credit accounts for the decay of longer-life nuclides, such as plutonium-241. The licensee uses the CASMO-4 code to calculate the reactivity credit available as a function of the decay of these nuclides. The licensee used the same methodology in its amendment for the soluble boron credit for ANO-2. The staff finds the licensee's method of crediting cooling time acceptable for its amendment.

Some of the licensee's storage patterns credit the presence of CEAs placed in various configurations. The presence of these CEAs provides additional negative reactivity. In accordance with NRC guidance provided in proposed Revision 2 to RG 1.13, the staff requested the licensee to provide detailed information describing the controls used to prevent inadvertent removal of a CEA from one of the stored assemblies. The staff reviewed the controls and found them to be acceptable. In addition, the misplaced assembly accident was found to be bounded by the misloaded fresh assembly accident.

In addition to the conservative assumptions already described, the licensee included other conservative assumptions in its calculation of the maximum K_{eff} values for the SFP. These assumptions include the following: 1) neutron absorption in minor structural members is neglected, and 2) any absorber rods present in a fuel assembly are modeled as fuel rods, resulting in higher predicted fuel reactivities. The staff reviewed each of the assumptions used in the licensee's analyses and agrees that each assumption provides a more conservative result and is consistent with the staff's guidance.

In addition to the five standard storage patterns proposed, the licensee evaluated a number of special storage conditions to determine their acceptability. These special conditions include all potential interface configurations, fresh fuel storage patterns, and storage of non-actinide material. In analyzing the various potential interface conditions, the licensee considered the interactions between different storage patterns within the same rack, the interactions of storage patterns in adjacent racks, and the interactions of assemblies located adjacent to walls. The licensee included the acceptable patterns and required limitations in its proposed TS changes. The staff reviewed each of the special storage conditions proposed by the licensee and either found the analyses performed acceptably or found the conditions permissible because other analyses are bounding.

The licensee calculated maximum K_{eff} values for each of the proposed SFP storage cases. The licensee's results show a maximum K_{eff} of 0.9979, 0.9392, 0.9985, 0.9983, and 0.9980 for all of the five patterns, unborated. Additionally, the licensee calculated the required soluble boron concentration under normal conditions, which would yield a maximum K_{eff} of 0.95. The analysis determined that the required concentration to meet this limit was 240 ppm. For accident condition analysis, the calculations indicated that a soluble boron concentration of 825 ppm is adequate to assure that the maximum K_{eff} does not exceed 0.95. These boron concentration values are well below the licensee's TS value of greater than 2000 ppm. The staff reviewed the licensee's criticality analyses of both unborated and borated cases and found that each meets the requirements of 10 CFR 50.68.

3.4 Boron Dilution Analysis

The licensee has proposed the use of several 2 x 2 loading patterns in the ANO-2 SFP, while taking credit for soluble boron, as a means of maintaining SFP reactivity within the K_{eff} limits of 10 CFR 50.68. The crediting of soluble boron in the criticality analysis will allow the neutron absorbing Boraflex material used for reactivity control in Region 1 of the SFP to be ignored. Therefore, the licensee completed a boron dilution analysis to support crediting soluble boron and the proposed TS revisions.

The minimum soluble boron concentration required to maintain K_{eff} below 0.95 is 240 ppm for the case of normal storage of fresh and spent fuel assemblies, and 825 ppm for the case in which the most serious credible accident is considered. The licensee has proposed a minimum TS soluble boron concentration of greater than 2000 ppm.

The ANO-2 SFP has a nominal water inventory of 199,200 gallons. The volume of water required to dilute the SFP to the minimum SFP soluble boron concentration of 240 ppm, based on an initial concentration of 2001 ppm, is approximately 422,000 gallons. The licensee considered various events that have the potential to dilute the SFP. Evaluations were performed for dilution events caused by (1) small failures or misaligned valves, (2) rupture of a fire protection system header or unborated water supply lines, and (3) SFP heat exchanger tube rupture.

<u>Small failures or misaligned valves</u>

Small failures or misaligned valves that might occur in the normal soluble boron control system or related systems might not be immediately detected. This would result in small flow rates of unborated water into the pool. The licensee has determined that the leak rate that would be associated with this source is on the order of 2 gallons per minute (gpm). At an assumed dilution flow-rate of 2 gpm, it will take 61 days to dilute the SFP boron concentration to the assumed accident concentration of 825 ppm, and 146 days for the boron concentration to be diluted to the minimum required boron concentration of 240 ppm for normal operation. The licensee has indicated that these dilution events would be detected by SFP high level alarms, observations in pool level changes by operators during required rounds every twelve hours, or through routine surveillance measurements of soluble boron concentration that is taken every 31 days. The staff verified the time to dilution through independent calculations, and concluded there is adequate time for operators to isolate the dilution inflow before reaching minimum acceptable concentrations.

<u>Rupture of a fire protection system header</u>

The rupture of a fire protection system header or an unborated water supply line could result in a high inflow of unborated water into the SFP. The licensee has evaluated these two scenarios and found that a flow rate of up to 2500 gpm is possible as a result of the rupture of a fire protection line, and a flow rate of 400 gpm could result from the failure of the demineralized water header. At a flow rate of 2500 gpm, the time required to dilute the SFP soluble boron concentration to 240 ppm, which is the minimum required concentration to maintain K_{eff} below 0.95 under normal operating conditions is 169 minutes. The 825 ppm concentration that is required for the most severe accident would be reached in 71 minutes. The licensee has indicated that, well before the spilling of the large quantity of water required to dilute the pool to the before mentioned concentration levels, multiple alarms would have alerted the control room of the accident consequences; among them, the fuel pool high alarm, the fire protection systems pump operation alarm, and the floor drain receiving tank high alarm. The break would result in a rapid drop in pressure in the fire protection header and the automatic startup of the fire protection pumps, which would be accompanied by an alarm, and the large flow rate would result in a high pool alarm about 5 minutes into the break. The licensee's response to a high pool level alarm is to investigate the cause. The combination of the fire protection pump and high pool level alarms would lead to early discovery of the failure and would allow sufficient time for corrective actions required to mitigate the event.

The licensee has determined that the dilution flow rate that would be associated with the failure of the demineralized water header would be 400 gpm. This flow rate is significantly lower than the flow rate associated with the rupture of the fire protection header (2500 gpm). Therefore, a greater amount of time will be required to dilute the SFP to minimum acceptable concentrations. The rupture of the demineralized water header would lead to an increase in the level of the SFP and result in pool water high level alarms, thus alerting control room operators of a problem. The staff verified the time to dilution through independent calculations and concluded there is adequate time for operators to identify and isolate the source of the dilution inflow before reaching minimum acceptable concentrations.

<u>SFP heat exchanger tube rupture</u>

The SFP heat exchanger provides a boundary between unborated service water on the shell side and borated pool water on the tube side. The operation of the heat exchanger is such that the shell side is at a higher pressure than the tube side. If a tube leak develops in a SFP heat exchanger, service water will leak into the SFP water.

The licensee has calculated the leakage associated with a double ended rupture of a single tube in the SFP heat exchanger to be approximately 250 gpm. At this dilution rate the SFP high level alarm will annunciate in the control room between two and eight minutes into the event. If there were to be a malfunction of the high level alarm, the level in the drain collect tanks that are monitored by the control room staff and waste control operator would begin to rise in about 1.2 hours, alerting the control room operators of the problem.

At the assumed dilution rate of 250 gpm, the licensee determined that it would take about 7.6 hours to dilute the SFP boron concentration to the assumed accident boron concentration of 825 ppm and about 18.1 hours to reach the minimum required boron concentration of 240 ppm for normal conditions. The staff verified the time to dilution through independent calculations and concluded there is adequate time for operators to identify and isolate the source of the dilution inflow before reaching minimum acceptable concentrations.

Boron Dilution Analysis Summary

The staff has reviewed the licensee's boron dilution analysis and finds that adequate time is available for detection and mitigation of events capable of diluting the SFP from the new proposed TS minimum soluble boron concentration of greater than 2000 ppm to the minimum concentration required to maintain K_{eff} below 0.95. Therefore the dilution aspects implicit within 10 CFR 50.68 and GDC 62 are met.

3.5 Proposed TS Changes

The licensee provided a descriptive list of requested changes to the ANO-2 TSs. The actual marked-up and revised TSs are located in Attachment 2 of the June 30, 2003, application, as supplemented by the August 1, 2003, letter. The staff reviewed each of these changes against the regulatory criteria described in Section 2.1 of this report and found them acceptable. The basis for the staff's acceptance and a description of the review it performed is discussed above in Sections 3.1 through 3.4 of this Safety Evaluation. The following is the descriptive list of proposed changes as provided by the licensee (Section 2.0 of Attachment 1 of the June 30, 2003, application and Response 3 of Attachment 1 of the August 1, 2003, supplemental letter):

(a) TS 3.9.12.a currently allows storage of fuel assemblies having an initial enrichment less than or equal to 5.0 wt% U-235 in the SFP. The fuel assembly initial enrichment will be changed based on the reactivity analysis performed to support the proposed change. The new fuel assembly initial enrichment will be limited to less than or equal to 4.55 ± 0.05 wt% U-235.

(b) TS 3.9.12.b, which currently describes the fuel loading restrictions in the defined Regions 1 and 2, will be changed. Instead of two separate regions, the pool will now become one region containing five 2 x 2 storage patterns, along with their interfacing relationships. This proposed change will allow credit for a combination of soluble boron and fuel positioning within the storage racks to maintain SFP reactivity. The five patterns include a combination of various fuel enrichments, fuel burnup, fuel cooling times, assemblies with CEAs inserted and without CEAs inserted, and water cells. Different fuel types or vacant spaces will be specified within the 2 x 2 patterns. The five loading patterns, which are reflected in TS Figure 3.9-2 of the submittal, have been evaluated to consider the reactivity effects based on various interfacing combinations. The allowable pattern interfaces will also be reflected in TS Figure 3.9-2.

(c) TS Figure 3.9.1: This figure, which was previously part of TS 3.9.12.b, and which shows Region 1 and Region 2 of the SFP, is being eliminated.

(d) TS Figure 3.9.2: The current minimum burnup versus initial assembly average U-235 loading curve depicted in TS Figure 3.9.2 will be deleted. New information reflecting the allowable 2 x 2 loading patterns, the acceptable interfaces between the five patterns, the minimum burnup requirements of type “A” and “C” assemblies at varying enrichment and cooling times, and bounding polynomial equations used to determine the minimum acceptable burnup for type “A” and “C” assemblies will be added as the proposed new TS Figure 3.9-2.

(e) A change to TS 3.9.12.c is proposed that will increase the SFP boron concentration from greater than 1600 ppm to greater than 2000 ppm. Since soluble boron will be credited to maintain SFP reactivity, the increase in the TS boron concentration will provide additional margin.

(f) Supporting changes are also proposed by the licensee to the Action and the Surveillance Requirements associated with TSs 3.9.12.a, 3.9.12.b and 3.9.12.c.

(g) TS 5.3.1.b: This TS is being revised to state that K_{eff} will be maintained less than or equal to 0.95 (normal conditions) when credit is taken for 240 ppm boron. Previously, no credit for boron was included in this TS.

(h) The current TS 5.3.1.c will become 5.3.1.d and a new TS 5.3.1.c will be added stating that K_{eff} will remain below 1.0 if the pool is flooded with unborated water, which includes allowance for uncertainties as described in the ANO-2 Safety Analysis Report.

(i) A change is also proposed to TS 5.3.2.a to limit the new fuel assembly U-235 enrichment to 4.55 ± 0.05 wt%. This change is a conservative restriction on fuel enrichment and does not have any adverse impact on the rack design.

The proposed changes to the TSs and the associated Bases are in accordance with NRC guidelines and compatible with the discussion in Sections 3.1 through 3.4 of this Safety Evaluation, and are, therefore, acceptable.

4.0 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.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendments involve 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding (68 FR 43382). Accordingly, the amendments meet 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 amendments.

6.0 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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

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