March 4, 2002

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: PEAK FUEL CENTERLINE TEMPERATURE (TAC NO. MB3935)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 238 to Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit No. 2. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated January 31, 2002.

The amendment revises the TSs by replacing the peak linear heat rate safety limit with a peak fuel centerline temperature safety limit.

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. 238 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. 238
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 January 31, 2002, 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. 238, 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: March 4, 2002

ATTACHMENT TO LICENSE AMENDMENT NO. 238

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
2-1	2-1
B 2-1	B 2-1
B 2-5	B 2-5

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 238 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 January 31, 2002, 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 by replacing the peak linear heat rate (PLHR) safety limit with a peak fuel centerline temperature safety limit.

2.0 BACKGROUND

The proposed change will replace the PLHR safety limit, TS 2.1.1.2, with a peak fuel centerline temperature safety limit. This change is necessary to comply with 10 CFR 50.36(c)(1)(ii)(A), which requires that limiting safety system settings (LSSSs) prevent a safety limit from being exceeded during normal operations and anticipated operational occurrences (AOOs).

The proposed change will replace the current PLHR TS 2.1.1.2 safety limit of 21 kilowatts per foot (kW/ft) with a peak fuel centerline temperature value, and a statement that this temperature will be adjusted for effects of fuel burnup and burnable absorbers. Because the adjustment for burnable absorbers is considered proprietary, a reference to the Nuclear Regulatory Commission (NRC) approved topical reports which provide the methodology for that adjustment will be included as part of the TS safety limit.

3.0 DISCUSSION

During a recent review of the Waterford Steam Electric Station, Unit 3 (Waterford 3), 1.5% Appendix K margin recovery power uprate license amendment request, the NRC staff identified that the PLHR safety limit of 21 kW/ft would be exceeded for an AOO. This does not comply with 10 CFR 50.36(c)(1)(ii)(A), which requires that LSSSs be in place such that automatic action will prevent safety limits from being exceeded during normal operations and AOOs. The NRC identified that the same condition exists with the ANO-2 TSs.

The two AOOs for which the PLHR safety limit is exceeded are the control element assembly (CEA) withdrawal events from subcritical and hot zero power conditions. These events and their acceptance criteria are discussed in Standard Review Plan (SRP) Section 15.4.1, "Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low Power Startup Condition." While the current safety limit of 21 kW/ft is exceeded during two AOOs, the peak fuel centerline temperature does not exceed the melting point, which is the true acceptance criteria for the event. The analysis results, including the linear heat rate greater than 21 kW/ft, for these events had been previously reviewed and found to be acceptable by the NRC staff in Amendment 138 for ANO-2, dated October 5, 1992. This approval is discussed in the current ANO-2 TS 2.1 Bases section. However, based on the recent review initiated by the power uprate license amendment request for Waterford 3, the staff has determined that exceeding the PLHR safety limit is not acceptable.

4.0 EVALUATION

The uncontrolled CEA withdrawal from subcritical and low power transients are classified as moderate frequency events (AOOs as defined in 10 CFR Part 50, Appendix A) and the acceptance criteria as discussed in NUREG-0800, SRP Section 15.4.1, include General Design Criteria (GDC)-10, "Reactor design," and GDC-20, "Protection system functions." These GDC's ensure that acceptable fuel design limits are not exceeded during the transient. The acceptable fuel design limits for this transient are: 1) no fuel pins experience departure from nucleate boiling, and 2) fuel centerline temperature does not exceed the melting point. Most Combustion Engineering (CE)-designed plants and the CE Standard TSs (STS) define the fuel centerline melt specified acceptable fuel design limit (SAFDL) in terms of a PLHR safety limit.

The intent of the PLHR safety limit is to prevent the fuel centerline temperature from reaching the melting point, which conservatively assures that there will be no breach in cladding integrity. The current 21 kW/ft limit was chosen because it is the highest steady state linear heat rate at which the fuel can operate without causing the centerline temperature to reach the melting point. This limit adequately addresses steady state operation (normal operation). For the two transients of interest, the PLHR exceeds 21 kW/ft. However, due to the short duration of these AOOs, deposited energy calculations demonstrate that the true acceptance criteria, the peak fuel centerline temperature, is not exceeded.

In accordance with 10 CFR Part 50, Appendix A, GDC-10 and GDC-20, the acceptance criteria for normal operation and AOOs is that the SAFDLs not be exceeded. The SAFDL of interest in this case is the peak fuel centerline temperature limit. This SAFDL is discussed in detail in SRP Section 4.2, "Fuel System Design," which states:

> "(II)(A)(2)(e) "Overheating of Fuel Pellets: It has also been traditional practice to assume that failure will occur if centerline melting takes place...For normal operation and anticipated operational occurrences, centerline melting is not permitted...The centerline melting criterion was established to assure that axial or radial relocation of molten fuel would neither allow molten fuel to come into contact with the cladding nor produce local hot spots. The assumption that centerline melting results in fuel failure is conservative."

Additionally, ANO-2 Safety Analysis Report (SAR), Section 4.4.1.1 lists the SAFDLs utilized for the design of the ANO-2 reactor. SAR Section 4.4.1.1.B states:

> "The peak temperature of the fuel will be less than the melting point...during normal operation and any anticipated operational occurrences."

Therefore, a more appropriate safety limit would be one that is based upon the peak fuel centerline temperature. A peak fuel centerline temperature safety limit would address both normal operation and AOOs, and would be consistent with 10 CFR Part 50, Appendix A, the SRP, the ANO-2 licensing basis, and 10 CFR 50.36. Maine Yankee Atomic Power Station, a CE-designed plant, previously requested and received NRC approval to change the PLHR safety limit to a peak fuel centerline safety limit (Amendment No. 124, November 18, 1991).

For ANO-2, the melting point of the fuel is dependent on fuel burnup and the amount and type of burnable poison used in the fuel. The design melting point of new fuel with no burnable poison is 5080 °F. The melting point is adjusted downward from this temperature based on the amount of burnup and amount and type of burnable poison in the fuel. The adjustment for burnup is 58 °F per 10,000 megawatt-days per metric ton uranium (MWD/MTU), which was accepted by the NRC staff in Topical Report CEN-386-P-A, "Verification of the Acceptability of a 1-Pin Burnup Limit of 60 MWD/kgU for Combustion Engineering 16x16 PWR [Pressurized Water Reactor] Fuel," dated August 1992. The burnable poison adjustments are determined in accordance with the NRC-approved methodology in Topical Reports CENPD-382-P-A, "Methodology for Core Designs Containing Erbium Burnable Absorbers," Revision 0, dated August 1993, for fuels containing erbium absorbers, and CENPD-275-P, Revision 1-P-A, "CE Methodology for Core Designs Containing Gadolinia-Urania Burnable Absorbers," dated May 1988, for fuels containing gadolinium. ANO-2 considers the adjustment for burnable absorbers to be proprietary information and therefore will reference these Topical Reports in the TS safety limit. The mode of applicability and actions required if the safety limit is exceeded would be the same as they are for the current PLHR safety limit. These changes will be incorporated into TS 2.1.1.2.

Additionally, the peak fuel centerline temperature safety limit proposed for ANO-2 is consistent with the peak fuel centerline temperature and maximum local fuel pin centerline temperature safety limits contained in the STS for Westinghouse Electric Company (Westinghouse) (NUREG-1431) and Babcock & Wilcox (B&W) (NUREG-1430)-designed plants. The STS for Westinghouse and B&W-designed plants contain an equation for decreasing the melting point based on the fuel burnup. The proposed safety limit for ANO-2 does not contain the same formula, but instead states that the limit is "...decreasing by 58 °F per 10,000 MWD/MTU for burnup and adjusting for burnable poisons per CENPD-275-P, Revision 1-P-A and CENPD-382-P-A." As stated above, this is acceptable because NRC-approved methods are used, and the portion of the adjustment formula accounting for burnable poison is proprietary and can not be placed in the TSs. This NRC-approved methodology will be referenced in TS 2.1.1.2 itself.

The NRC staff maintained regular communications with the ANO-2 staff during preparation of this TS change, has reviewed this amendment request, and finds it to be acceptable. A peak fuel centerline temperature safety limit of less than 5080 °F (decreasing by 58 °F per 10,000 MWD/MTU for burnup and adjusting for burnable poisons per CENPD-275-P, 1-P-A and

CENPD-382-P-A) is more appropriate than the current PLHR safety limit for the following reasons:

- it addresses both normal operation and AOOs,
- it is consistent with 10 CFR Part 50, Appendix A criteria,
- it is consistent with SAFDLs,
- it is consistent with SRP acceptance criteria,
- it is consistent with the ANO-2 licensing basis,
- it is determined using NRC-approved methodologies, and
- it clearly conforms to 10 CFR 50.36(c)(1)(ii)(A).

The TS Bases for Sections 2.1.1 and 2.2.1 would also be revised to reflect the change to a peak fuel centerline temperature safety limit and provide a reference to the methods for calculating the safety limit.

5.0 EVALUATION SUMMARY

The staff has reviewed the licensee's application and supporting documentation, and additional information obtained through discussions with the licensee. Based on the considerations discussed above, the staff has concluded that the proposed revisions to the TSs and Bases identified above are acceptable.

6.0 EXIGENT CIRCUMSTANCES

The amendment request was submitted on an exigent basis because the proposed revision to the ANO-2 safety limit for conformance to 10 CFR 50.36, which is in response to an issue that was only recently identified by the NRC, needs to be approved before the NRC can act on the ANO-2 power uprate license amendment request, which the licensee has requested for the April 2002 refueling outage. Therefore, the licensee requested that this proposed TS change be considered as submitted under exigent circumstances as described in 10 CFR 50.91(a)(6).

In addition to the above concern with obtaining approval of this amendment request quickly so that it does not impact the power uprate amendment request, the NRC believes that the existing TS safety limit for protecting the fuel is not in conformance with 10 CFR 50.36. Given the importance of safety limits, the NRC believes that the existing safety limit should be revised as quickly as possible. Accordingly, based on the above discussion, insufficient time remains for normal NRC processing and notification.

Based on the above circumstances, the NRC finds that the licensee used its best efforts to make a timely application as soon as it was informed that the NRC had concerns with the PLHR safety limit, and could not have avoided the need for the exigency. The NRC also finds that, in light of these circumstances, the licensee and the Commission must act quickly and time does not permit the Commission to publish a *Federal Register* notice allowing 30 days for public comment. As set forth below, the NRC has determined that this amendment involves no significant hazards consideration. Based on the foregoing, the NRC finds that exigent circumstances exist as defined in 10 CFR 50.91(a)(6), with regard to the license amendment requested by the licensee's application dated January 31, 2002.

7.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission's regulations in 10 CFR 50.92 state that the Commission may make a final determination that a license amendment involves no significant hazards consideration if operation of the facility, in accordance with the amendment, would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated, or (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. As required by 10 CFR 50.91(a), the licensee has provided its analysis of the issue. The staff's analysis is set forth below.

The proposed amendment would revise the TSs by replacing the PLHR safety limit with a peak fuel centerline temperature safety limit. The accidents analyzed in Chapter 15 of the ANO-2 SAR where the PLHR may exceed the LSSS of 21 kW/ft are the CEA withdrawals at subcritical conditions and at hot zero power.

This change does not increase the probability of an accident previously evaluated because the proposed change does not require any change to plant systems, structures, or components, nor does it require any change in plant operations. The change does not increase the consequences of an accident because the change to establish the peak fuel centerline temperature as the TS safety limit is consistent with the current licensing basis of ANO-2 for protecting the fuel.

The change does not establish a new accident precursor, nor does it affect the method or manner in which the plant is operated. Therefore, the change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed change does not change any safety analysis methods or results. In addition, changing the TS safety limit from PLHR to peak fuel centerline temperature establishes a margin in the TSs that is consistent with the current licensing basis of ANO-2 for protecting the fuel. Therefore, the change does not involve a significant reduction in a margin of safety.

Based on the above considerations, the NRC staff concludes that the amendment meets the three criteria of 10 CFR 50.92. Therefore, the staff has made a final determination that the proposed amendment does not involve a significant hazards consideration.

8.0 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.

9.0 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 (67 FR 6279, dated February 11, 2002). 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.

10.0 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: M. Kowal
T. Alexion

Date: March 4, 2002

cc:

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