November 8, 1993

Docket No. 50-368

Mr. Jerry W. Yelverton
Vice President, Operations ANO
Entergy Operations, Inc.
Route 3 Box 137G
Russellville, Arkansas 72801

Dear Mr. Yelverton:

SUBJECT: ISSUANCE OF AMENDMENT NO. 152 TO FACILITY OPERATING LICENSE NO. NPF-6 - ARKANSAS NUCLEAR ONE, UNIT NO. 2 (TAC NO. M86419)

The Commission has issued the enclosed Amendment No. 152 to Facility Operating License No. NPF-6 for the Arkansas Nuclear One, Unit No. 2 (ANO-2). This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated May 7, 1993.

The amendment changes the Appendix A Technical Specifications by revising the limiting conditions for operation, action requirements, and surveillance requirements of TS 3/4.5.1 to reflect changes in the operation of the safety injection tanks.

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

Sincerely,

ORIGINAL SIGNED BY:

Thomas W. Alexion, Project Manager
Project Directorate IV-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 152 to NPF-6
2. Safety Evaluation

cc w/enclosures:
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~~Docket File~~	NRC/Local PDR	PD4-1 Reading	WBeckner
T. Alexion (2)	E. Adensam	J. Roe	RSchaaf
P. Noonan	ACRS (10) (P315)	OGC(15B18)	
D. Hagan (3206)	G. Hill (2	W. Johnson, RIV	
C. Grimes (11E22)	OPA (2G5)	OC/LFMB (4503)	

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#93-169

OFC	LA:PD4-1	PE:PD4-1	PM:PD4-1	SRXB	OTSB	OGC	D(A):PD4-1
NAME	PNoonan	RSchaaf:pk	TAlexion	RJones	CGrimes		WBeckner
DATE	10/19/93	10/19/93	10/19/93	10/19/93	10/22/93	11/1/93	11/8/93

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OFC	LA:PD4-1	PE:PD4-1	PM:PD4-1	SRXB	OTSB	OGC	D(A):PD4-1
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

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See next page

cc:

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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. 152
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 May 7, 1993, 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. 152, 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.

FOR THE NUCLEAR REGULATORY COMMISSION

William D. Beckner, Director
Project Directorate IV-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 8, 1993

ATTACHMENT TO LICENSE AMENDMENT NO. 152

FACILITY OPERATING LICENSE NO. NPF-6

DOCKET NO. 50-368

Revise the following pages of the Appendix "A" Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change.

REMOVE PAGES	INSERT PAGES
3/4 5-1	3/4 5-1
3/4 5-2	3/4 5-2
B 3/4 5-1	B 3/4 5-1
B 3/4 5-2	B 3/4 5-2
-	B 3/4 5-3

3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

SAFETY INJECTION TANKS

LIMITING CONDITION FOR OPERATION

3.5.1 Each reactor coolant system safety injection tank shall be OPERABLE with:

a. The isolation valve open,

b. A contained borated water volume of between 1413 and 1539 cubic feet (equivalent to an indicated level between 80.1% and 87.9%, respectively),

c. Between 2200 and 3000 ppm of boron, and

d. A nitrogen cover-pressure of between 600 and 624 psig.

APPLICABILITY: MODES 1, 2 and 3.*

ACTION:

a. With one safety injection tank inoperable, due to boron concentration not within limits, restore the boron concentration to within limits within 72 hours, or be in HOT STANDBY within the next 6 hours and reduce pressurizer pressure to <700 psia within the next 12 hours.

b. With one safety injection tank inoperable for reasons other than boron concentration, restore the SIT to OPERABLE status within 1 hour, or be in HOT STANDBY within the next 6 hours and reduce pressurizer pressure to <700 psia within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.5.1 Each safety injection tank shall be demonstrated OPERABLE:

a. At least once per 12 hours by:

1. Verifying the contained borated water volume and nitrogen cover-pressure in the tanks, and

2. Verifying that each safety injection tank isolation valve (2CV-5003, 2CV-5023, 2CV-5043 and 2CV-5063) is open.

*With pressurizer pressure ≥ 700 psia.

SURVEILLANCE REQUIREMENTS (Continued)

b. At least once per 31 days and within 6 hours after each solution volume increase of ≥ 5% of indicated tank level that is not the result of addition from the RWT, by verifying the boron concentration of the safety injection tank solution.

c. At least once per 31 days when the RCS pressure is above 2000 psia, by verifying that power to the isolation valve operator is removed by maintaining the motor circuit breaker open under administrative control.

d. At least once per 18 months by verifying that each safety injection tank isolation valve opens automatically under each of the following conditions:

1. When the RCS pressure exceeds 700 psia, and

2. Upon receipt of a safety injection test signal.

BASES

3/4.5.1 SAFETY INJECTION TANKS

The OPERABILITY of each of the RCS safety injection tanks ensures that a sufficient volume of borated water will be immediately forced into the reactor core through each of the cold legs in the event the RCS pressure falls below the pressure of the safety injection tanks. This initial surge of water into the core provides the initial cooling mechanism during large RCS pipe ruptures.

The limits on safety injection tank volume, and pressure ensure that the assumptions used for safety injection tank injection in the accident analysis are met.

The upper limit on Safety Injection Tank (SIT) boron supports the analysis for boron precipitation and minimum pH of the post LOCA containment solution. The lower limit allows the use of the RWT as a makeup source requiring no sample to be performed after a volume addition, while maintaining a value sufficient to prevent challenging the accident analysis values due to postulated boron concentration dilutions from sources other than the RWT. The accident analysis assumes a lower value of 2000 ppm boron.

Sampling the affected SIT within 6 hours after a 5% level increase will identify whether inleakage has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water is from the RWT, because the solution contained in the RWT is within the SIT boron concentration requirements.

The safety injection tank power operated isolation valves are considered to be "operating bypasses" in the context of IEEE Std. 279-1971, which requires that bypasses of a protective function be removed automatically whenever permissive conditions are not met. In addition, as these safety injection tank isolation valves fail to meet single failure criteria, removal of power to the valves is required.

If the boron concentration of one SIT is not within limits, it must be returned to within the limits within 72 hours. In this condition, ability to maintain subcriticality or minimum boron precipitation time may be reduced, but the reduced concentration effects on core subcriticality during reflood are minor. Boiling of the ECCS water in the core during reflood concentrates the boron in the saturated liquid that remains in the core. Since boron requirements are based on the average boron concentration of the total volume of three SITs, the consequences are less severe than they would be if an SIT were not available for injection.

If one SIT is inoperable, for a reason other than boron concentration, the SIT must be returned to OPERABLE status within 1 hour. In this condition, the required contents of three SITs cannot be assumed to reach the core during a LOCA. Due to the severity of the consequences should a LOCA occur in these conditions, the 1 hour completion time to open the valve, remove power to the valve operator, or restore proper water volume or nitrogen cover pressure ensures that prompt action will be taken to return the inoperable SIT to OPERABLE status. The completion time minimizes the exposure of the plant to a LOCA while a SIT is inoperable.

3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The OPERABILITY of two separate and independent ECCS subsystems ensures that sufficient emergency core cooling capability will be available in the event of a LOCA assuming the loss of one subsystem through any single failure consideration. Either subsystem operating in conjunction with the safety injection tanks is capable of supplying sufficient core cooling to limit the peak cladding temperatures within acceptable limits for all postulated break sizes ranging from the double-ended break of the largest RCS cold leg pipe downward. In addition, each ECCS subsystem provides long term core cooling capability in the recirculation mode during the accident recovery period.

The Surveillance Requirements provided to ensure OPERABILITY of each component ensures that at a minimum, the assumptions used in the accident analyses are met and that subsystem OPERABILITY is maintained. Surveillance requirements of throttle valve position stops and flow balance testing provide assurance that proper ECCS flows will be maintained in the event of a LOCA. Maintenance of proper flow resistance and pressure drop in the piping system to each injection point is necessary to: (1) prevent total pump flow from exceeding runout conditions when the system is in its minimum resistance configuration, (2) provide the proper flow split between injection points in accordance with the assumptions used in the ECCS-LOCA analyses, and (3) provide an acceptable level of total ECCS flow to all injection points equal to or above that assumed in the ECCS-LOCA analyses. The acceptance criteria specified in the Surveillance Requirements for HPSI single pump flow, HPSI differential pressure, and LPSI differential pressure does not account for instrument error.

3/4.5.4 REFUELING WATER TANK (RWT)

The OPERABILITY of the RWT as part of the ECCS ensures that a sufficient supply of borated water is available for injection by the ECCS and CSS in the event of a LOCA. The limits on RWT minimum volume and boron concentration ensure that 1) sufficient water is available within containment to permit recirculation cooling flow to the core, and (2) the reactor will remain subcritical in the cold condition following mixing of the RWT and the RCS water volumes with all control rods inserted except for the most reactive control assembly. These assumptions are consistent with the LOCA analyses.

BASES

The contained water volume limit includes an allowance for water not usable because of tank discharge line location or other physical characteristics.

The limits on contained water volume and boron concentration of the RWT also ensure a pH value of between 8.8 and 11.0 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 152 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 May 7, 1993, 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 TS Section 3/4.5, "Emergency Core Cooling Systems."

The licensee proposed the following specific changes to TS 3/4.5.1: (1) reduce the specified minimum safety injection tank (SIT) boron concentration from 2500 parts per million (ppm) to 2200 ppm; (2) revise the related Actions to allow one SIT to be inoperable due to boron concentration alone for 72 hours and to allow one SIT to be inoperable for any other reason for 1 hour; (3) revise a surveillance requirement to specify sampling of the affected SIT within 6 hours of a 5% indicated tank level increase that is not the result of addition from the refueling water tank (RWT); (4) revise a surveillance requirement reference to the reactor coolant system pressure from 700 psig to 700 psia; and (5) revise the associated Bases to reflect these changes.

2.0 EVALUATION

2.1 Background

The functions of the four SITs are to supply water to the reactor vessel during the blowdown phase of a loss-of-coolant accident (LOCA), to provide inventory to help accomplish the refill phase that follows, and to provide reactor coolant system (RCS) makeup for certain small-break LOCAs.

The SITs are pressure vessels partially filled with borated water and pressurized with nitrogen gas. The SITs are passive components, since no operator or control action is required for them to perform their function. Internal tank pressure is sufficient to discharge the contents to the RCS, if RCS pressure decreases below the SIT pressure.

Each SIT is piped into one RCS cold leg via the injection lines used by the high-pressure safety injection (HPSI) and low-pressure safety injection (LPSI)

systems. Each SIT is isolated from the RCS by a motor-operated isolation valve and two check valves in series. The motor-operated isolation valves are normally open, with power removed from the valve motor to prevent inadvertent closure prior to or during an accident. Additionally, the isolation valves are interlocked with the pressurizer pressure instrumentation channels to ensure that the valves will automatically open as RCS pressure increases above SIT pressure and to prevent inadvertent closure prior to an accident. The valves also receive a safety injection actuation signal (SIAS) to open. These features ensure that the SITs will be available for injection without reliance on operator action.

The SIT gas and water volumes, gas pressure, and outlet pipe size are selected to allow three of the four SITs to recover the core before significant clad melting or zirconium water reaction can occur following a LOCA. The need to ensure that three SITs are adequate for this function is consistent with the assumption that the entire contents of one SIT will be lost via the break during the blowdown phase of a LOCA.

2.2 Discussion of Proposed Changes

2.2.1 Minimum SIT Boron Concentration

The minimum boron concentration requirement is based on beginning-of-life reactivity values and is selected to ensure that the reactor will remain subcritical during the reflood stage of a large-break LOCA. During a large-break LOCA, all control element assemblies (CEAs) are assumed not to insert into the core, and the initial reactor shutdown is accomplished by void formation during blowdown. Sufficient boron concentration must be maintained in the SITs to prevent a return to criticality during reflood.

The accident analysis for ANO-2 uses a minimum SIT boron concentration of 2000 ppm. The current minimum SIT boron concentration of 2500 ppm was selected as an operator convenience in that both the SIT and RWT minimum concentrations were specified at the same value. The licensee has proposed to reduce the SIT minimum boron concentration requirement to 2200 ppm. Specifying a value of 2200 ppm will allow the plant operators to quickly adjust SIT boron concentration to a higher value by addition from the RWT in the event that the SIT boron concentration is diluted by inleakage.

Operation with the proposed minimum SIT boron concentration will maintain a margin to the concentration used in the accident analysis, ensuring subcriticality during reflood. Therefore, the staff finds the proposed revision acceptable.

2.2.2 Action Requirements

If one SIT is inoperable due to boron concentration being outside the specified limits, the licensee has proposed a 72-hour completion time to return it to within the limits. In this condition, the ability to maintain

subcriticality (if the boron concentration is too low), or the minimum boron precipitation time (if the boron concentration is too high), may be reduced.

The effect on core subcriticality during reflood due to a reduction in boron concentration in one SIT to below the minimum value is minor. The dominant reactivity contributor during this phase is void formation in the core and control element assembly insertion. Long-term reactivity control does rely on boron concentration in the core; however, post-accident boron concentration in the core is dominated by the RWT inventory added by the safety injection pumps.

In addition, the volume of the SIT is still available for injection. Since the boron requirements are based on the average boron concentration of the total volume of three SITs, the consequences of a reduction in boron concentration in one SIT to below the minimum value are less severe than they would be if a SIT were not available for injection.

Boiling of the emergency core cooling system (ECCS) water in the core during and subsequent to reflood concentrates the boron in the saturated liquid that remains in the core. Continued concentration could result in boron precipitation, which could adversely affect the ability to provide long-term core cooling. Boron concentration in excess of the maximum allowed value in one SIT could reduce the time at which this precipitation would begin; however, as stated above, boron concentration in the core is dominated by the RWT inventory. Therefore, the effect on boron precipitation time would be minimal.

Based upon the minimal effect on core subcriticality or boron precipitation expected due to boron concentration in one SIT being outside the TS limits, the staff concludes that a 72-hour completion time for returning the boron concentration to within TS limits is acceptable.

If one SIT is inoperable for a reason other than boron concentration, the licensee has proposed a 1-hour completion time for returning the SIT to OPERABLE status. In this condition, the required contents of three SITs cannot be assumed to reach the core during a LOCA due to the unavailability of the inoperable SIT and the assumption that the contents of one SIT are lost via the break. Due to the severity of the consequences should a LOCA occur under these conditions, a 1-hour completion time to open the isolation valve, remove power to the valve, or restore the proper water volume or nitrogen cover gas pressure ensures that prompt action will be taken to return the inoperable accumulator to OPERABLE status. The completion time minimizes the exposure of the plant to a LOCA in these conditions. This is acceptable to the staff.

2.2.3 Sampling Requirements

The licensee proposed two changes to Surveillance Requirement (SR) 4.5.1.b, which stipulates the requirements regarding verification of SIT boron

concentration. The licensee requested that samples be required after an indicated level increase of ≥5% in lieu of the present requirement that such samples be conducted after a volume increase of ≥1%. The licensee also requested that such samples not be required if the source of the level increase is the RWT.

The licensee provided a calculation to demonstrate the effect on SIT boron concentration of an increase in indicated tank level of 5% containing no boron. The calculation, which assumed that the SIT started at the minimum allowed volume and the revised minimum specified boron concentration, demonstrated that after a 5% increase in indicated level containing no boron, the final boron concentration of the SIT would remain above the safety analysis value of 2000 ppm. A similar calculation showed that a potential dilution from the minimum allowed volume to the maximum allowed volume (an increase of approximately 7.8% of indicated tank level) would still result in a boron concentration slightly above the value assumed in the accident analysis.

Based on the determination that a 5% level increase would not challenge the boron concentration value assumed in the safety analysis, the staff finds the proposed change from 1% of tank volume to 5% of indicated tank level to be acceptable. The use of tank level in the specification in lieu of volume is consistent with the instrumentation available to the operators.

The licensee stated that it is not necessary to verify boron concentration if the added water is from the RWT, because the water contained in the RWT is within the SIT boron concentration requirements. This is consistent with the recommendations contained in NUREG-1366, "Improvements to Technical Specifications Surveillance Requirements," and is considered acceptable to the staff.

2.2.4 Applicability at 700 psia versus SR at 700 psig

The licensee proposed a change to SR 4.5.2.d.1 regarding verification of automatic operation of the SIT isolation valve. The existing specification contains a discrepancy between the Applicability of the TS and the SR.

The TS is specified as being applicable in Modes 1, 2 and 3 (when RCS pressure is >700 psia). SR 4.5.2.d.1 requires verification that the SIT isolation valves automatically open when RCS pressure exceeds 700 psig. This SR does not ensure that the applicability requirement of >700 psia (which corresponds to approximately 685 psig) is met. The licensee proposed to revise the SR value from 700 psig to 700 psia to be consistent with the TS applicability statement and the available pressurizer pressure instrumentation, which reads out in psia. This change will ensure that the SITs are available when required by the TS applicability statement and is, therefore, acceptable to the staff.

2.2.5 Bases Changes

The staff finds that the proposed bases changes clarify the intent of the significant changes discussed above and are, therefore, acceptable.

3.0 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.

4.0 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 and changes surveillance requirements. 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 (58 FR 34075). 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.

5.0 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: R. Schaaf

Date: November 8, 1993