

October 15, 1991

Mr. Neil S. Carns
Vice President, Operations ANO
Entergy Operations, Inc.
Route 3 Box 137G
Russellville, Arkansas 72801

Dear Mr. Carns:

SUBJECT: ISSUANCE OF AMENDMENT NO. 126 TO FACILITY OPERATING LICENSE
NO. NPF-6 - ARKANSAS NUCLEAR ONE, UNIT NO. 2 (TAC NO. 79905)

The Commission has issued the enclosed Amendment No.126 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 February 25, 1991.

The amendment reduces the required minimum flow rate of reactor coolant through the reactor coolant system from 3000 gpm to 2000 gpm in TS 3/4.1.1.3 and its associated Bases. The purpose of this change is to reduce the potential for pump vortexing as described in Generic Letter 88-17, "Loss of Decay Heat Removal." The amendment also revises the applicable pump for this TS from a low pressure safety injection pump to either a low pressure safety injection or containment spray pump for use in shutdown cooling.

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,
/S/

Sheri R. Peterson, Project Manager
Project Directorate IV-1
Division of Reactor Projects III, IV, and V
Office of Nuclear Reactor Regulation

Enclosures:

- 1. Amendment No.126 to NPF-6
- 2. Safety Evaluation

cc w/enclosures:
See next page

DISTRIBUTION:

Docket File	NRC/Local PDR	PD4-1 Reading	S. Peterson (2)
M. Virgilio	J. Larkins	P. Noonan	ACRS(10)(MSP315)
OGC(MS15B18)	D. Hagan(MS3206)	G. Hill(4)(MSP137)	
Wanda Jones(MS7103)	C. Grimes(MS11E22)	PD4-1 Plant File	
GPA/PA(MS2G5)	ARM/LFMB(MS4503)	T. Westerman, RIV	

*See previous concurrence

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OFC	: PD4-1/LA	: PD4-1/PM	: *OGC	: PD4-1/D	:	:
NAME	: PNoonan	: SPeterson	:	: JLarkins	:	:
DATE	: 10/16/91	: 10/11/91	: 10/03/91	: 10/16/91	:	:

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Mr. Neil S. Carns
Entergy Operations, Inc.

Arkansas Nuclear One, Unit 2

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

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 126
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 February 25, 1991, 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.

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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. 126, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. The license amendment is effective 30 days after its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



John T. Larkins, Director
Project Directorate IV-1
Division of Reactor Projects III, IV, and V
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: October 16, 1991

ATTACHMENT TO LICENSE AMENDMENT NO. 126

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

3/4 1-4
B 3/4 1-1

INSERT PAGES

3/4 1-4
B 3/4 1-1

REACTIVITY CONTROL SYSTEMS

BORON DILUTION

3.1.1.3 The flow rate of reactor coolant through the reactor coolant system shall be ≥ 2000 gpm whenever a reduction in Reactor Coolant System boron concentration is being made. |

APPLICABILITY: ALL MODES.

ACTION:

With the flow rate of reactor coolant through the reactor coolant system < 2000 gpm, immediately suspend all operations involving a reduction in boron concentration of the Reactor Coolant System. |

4.1.1.3 The flow rate of reactor coolant through the reactor coolant system shall be determined to be ≥ 2000 gpm within one hour prior to the start of and at least once per hour during a reduction in the Reactor Coolant System boron concentration by either: |

- a. Verifying at least one reactor coolant pump is in operation, or
- b. Verifying that at least one low pressure safety injection pump or containment spray pump is in operation as a shutdown cooling pump and supplying ≥ 2000 gpm through the reactor coolant system. |

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements vary throughout core life as a function of fuel depletion, RCS boron concentration, and RCS T_{avg} . The most restrictive condition occurs at EOL, with T_{avg} at no load operating temperature, and is associated with a postulated steam line break accident, and resulting uncontrolled RCS cooldown. In the analysis of this accident, a minimum SHUTDOWN MARGIN of 5.5% $\Delta k/k$ is required to control the reactivity transient. Accordingly, the SHUTDOWN MARGIN requirement is based upon this limiting condition and is consistent with FSAR safety analysis assumptions. With $T_{avg} \leq 200^\circ\text{F}$, the reactivity transients resulting from any postulated accident are minimal and a 5% $\Delta k/k$ shutdown margin provides adequate protection.

3/4.1.1.3 BORON DILUTION

A minimum flow rate of at least 2000 GPM provides adequate mixing, prevents stratification and ensures that reactivity changes will be gradual during boron concentration reductions in the Reactor Coolant System. A flow rate of at least 2000 GPM will circulate an equivalent Reactor Coolant System volume of 6,650 cubic feet in approximately 25 minutes. The reactivity change rate associated with boron concentration reductions will therefore be within the capability of operator recognition and control.

3/4.1.1.4 MODERATOR TEMPERATURE COEFFICIENT (MTC)

The limitations on MTC are provided to ensure that the assumptions used in the accident and transient analysis remain valid through each fuel cycle. The surveillance requirements for measurement of the MTC during each fuel cycle are adequate to confirm the MTC value since this coefficient changes slowly due principally to the reduction in RCS boron concentrations associated with fuel burnup. The confirmation that the measured MTC value is within its limit provided assurances that the coefficient will be maintained within acceptable values throughout each fuel cycle.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 126 TO
FACILITY OPERATING LICENSE NO. NPF-6

ENERGY OPERATIONS, INC.,

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

1.0 INTRODUCTION

In NRC Generic Letter 88-17, the staff identified a concern regarding potential loss of decay heat removal (DHR) due to air ingestion into the shutdown cooling (SDC) system as a result of vortexing during reduced reactor coolant system (RCS) inventory operation. A high SDC system flow rate contributes to the likelihood that air will be ingested which could bind the SDC pumps and result in pump cavitation and the loss of DHR. The staff recommended that licensees should evaluate and propose changes to the Technical Specifications (TS) limiting condition for operation (LCO) on SDC system flow rate to enhance the overall reliability of SDC system operation.

By letter dated February 25, 1991 (Ref. 1), Entergy Operations, Inc., proposed changes to the TS for Arkansas Nuclear One, Unit 2 (ANO-2). This was for TS 3/4.1.1.3 and the associated Bases 3/4.1.1.3 to reduce the required SDC system flowrate during Mode 5 operation. Additional information was supplied in a telecon (Ref. 2). At the currently required flowrate of 3,000 gpm the SDC system could be susceptible to vortexing at the SDC pump suction piping during RCS partial drain operation. The licensee proposed a reduction of the SDC flowrate to 2,000 gpm in TS 3/4.1.1.3 and Bases 3/4.1.1.3. Also, the licensee proposed to change the applicable pump in TS 3/4.1.1.3 from a low pressure safety injection pump to either a low pressure safety injection or containment spray pump for use in shutdown cooling.

The licensee had previously proposed a similar amendment to reduce the minimum SDC loop flow from 3,000 gpm to 2,000 gpm for Mode 6 operation by letter dated December 15, 1989. On April 30, 1990, the staff approved the flow reduction for Mode 6 operation and issued Amendment No. 104 to the Facility Operating License.

2.0 EVALUATION

2.1 Adequate Flow to Remove Decay Heat

Operation with the RCS partially drained in Modes 5 and 6 is necessary for required inspection and maintenance of RCS components such as reactor coolant pumps and steam generators. As indicated in NUREG-1269 (Ref. 3), reduced SDC

system flowrate would provide a greater margin against vortexing and preclude an inadvertent loss of decay heat removal capability due to air entrainment and cavitation of the SDC pumps. As the time after plant shutdown increases, decay heat removal requirements from the SDC suction flow are reduced since decay heat decreases as a function of time after initial reactor shutdown. For ANO-2 the Combustion Engineering (CE) Owners Group has recommended a minimum flowrate of 2,000 gpm for the SDC system. The 2,000 gpm value is limited by the potential for excessive wear in the pumps. The proposed TS change will require that the SDC flowrate be maintained at least equal to or greater than 2,000 gpm. ANO performed a vortexing test to determine the level at which vortexing would occur at various flow rates. This test verified that the proposed 2,000 gpm was acceptable with a minimum RCS level of 10 inches above the bottom of the RCS hot leg. An RCS level of 19 inches is the procedurally required minimum level for SDC operation. The change proposed by Entergy has been evaluated by the licensee to provide sufficient flowrate to maintain the RCS at equal or less than 200°F as required for Mode 5 operation. Operation at the reduced flow rate of 2,000 gpm was previously approved for Mode 6 operation. The staff therefore finds that the proposed TS change provides reasonable assurance that adequate flow to remove decay heat will be available during Mode 5 operation, while the potential to vortexing is minimized.

2.2 Adequate Flow to Ensure Mixing

Entergy and CE evaluated the effect of reduced RHR flowrate on the Final Safety Analysis Report (FSAR) boron dilution accident analysis and determined that the reduction in flowrate does not impact the results of the analysis. The staff considers that the consequences of a boron dilution event when the SDC flow rate is 2,000 gpm are bounded by the FSAR analysis.

2.3 Use of the Containment Spray Pump for Shutdown Cooling

The licensee proposed that the containment spray pump be added as an optional pump for use during the shutdown cooling operation. This is in addition to the low pressure safety injection pump currently specified in TS 3/4.1.1.3. The piping configurations for ANO-2 allows use of either the low pressure safety injection pump or containment spray pump for heat removal. The purpose is to have more flexibility for scheduling maintenance on the pumps. The staff considers the use of the containment spray pump to be acceptable as it has the required capacity and safety qualification for the SDC operation.

3.0 EVALUATION OF TECHNICAL SPECIFICATIONS

As a result of reducing the minimum residual heat removal flowrate and adding the use of the containment spray pump, changes to the plant's TS were proposed. The following TS were examined.

Change 1 TS 3/4.1.1.3, page 3/4 1-4 - Boron Dilution

The reference to a minimum flow of 3,000 gpm was changed to 2,000. This is acceptable as explained in Section 2.0.

Change 2 TS 4.1.1.3, page 3/4 1-4 - Surveillance Requirements for Boron Dilution

In addition to the use of the low pressure safety injection pump the containment spray pump was added as an option for use in the shutdown cooling operation. This is acceptable as the containment spray pump has the proper characteristics and provides for more flexibility in performing the task.

Change 3 Bases 3/4.1.1.3, page B 3/4 1-1 - Boron Dilution

The reference to a minimum flow of 3,000 gpm was changed to 2,000. This is acceptable as explained in Section 2.0. Also, the cubic feet pumped in 25 minutes was changed from 9,975 cubic feet to 6,650 cubic feet. This change is acceptable as it represents the reduction in cubic feet pumped for the lower flowrate.

The proposed TS changes include a reduction in the shutdown cooling system flowrate during operation in Mode 5 as was previously approved for Mode 6. Also, the containment spray pump was added as an optional pump for use during the shutdown cooling operation. The changes are consistent with the position of Generic Letter 88-17 and were found to be acceptable as discussed in Section 2.0.

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 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 (56 FR 20035). 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.

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

7.0 REFERENCES

1. Letter, Neil S. Carns, Entergy Operations, Inc., to USNRC, dated February 25, 1991.
2. Telecon, Curt Taylor, Entergy Operations, Inc., and USNRC, August 28, 1991.
3. NUREG-1269, "Loss of Residual Heat Removal at Diablo Canyon Unit 2."

Principal Contributor: H. Balukjian

Date: October 16, 1991