November 13, 2000

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

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 2 - ISSUANCE OF AMENDMENT RE: CONTAINMENT COOLING SYSTEM (TAC NO. MA9351)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 226 to Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit No. 2 (ANO-2). This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated June 29, 2000, as supplemented by letter dated October 4, 2000.

The amendment revises the containment cooling system TSs to require that two independent containment cooling groups are operable with two operational cooling units in each group, in Modes 1, 2, 3, and 4.

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

Sincerely,

/RA/

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

Docket No. 50-368

Enclosures:
1. Amendment No. 226 to NPF-6
2. Safety Evaluation

cc w/encls: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001
November 13, 2000

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Thomas W. Alexion

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Arkansas Nuclear One

cc:

Executive Vice President
& Chief Operating Officer
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Director, Division of Radiation
Control and Emergency Management
Arkansas Department of Health
4815 West Markham Street, Slot 30
Little Rock, AR 72205-3867

Winston & Strawn
1400 L Street, N.W.
Washington, DC 20005-3502

Manager, Rockville Nuclear Licensing
Framatone Technologies
1700 Rockville Pike, Suite 525
Rockville, MD 20852

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 310
London, AR 72847

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

County Judge of Pope County
Pope County Courthouse
Russellville, AR 72801

Vice President, Operations Support
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Wise, Carter, Child & Caraway
P. O. Box 651
Jackson, MS 39205

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. 226
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 29, 2000, as supplemented by letter dated October 4, 2000, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

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

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

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

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

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

   2. Technical Specifications

      The Technical Specifications contained in Appendix A, as revised through Amendment No. 226 , 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

Robert A Gramm

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

Attachment: Changes to the Technical Specifications

Date of Issuance: November 13, 2000

cc:

Executive Vice President
& Chief Operating Officer
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Director, Division of Radiation
Control and Emergency Management
Arkansas Department of Health
4815 West Markham Street, Slot 30
Little Rock, AR 72205-3867

Winston & Strawn
1400 L Street, N.W.
Washington, DC 20005-3502

Manager, Rockville Nuclear Licensing
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1700 Rockville Pike, Suite 525
Rockville, MD 20852

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Arlington, TX 76011-8064

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Pope County Courthouse
Russellville, AR 72801

Vice President, Operations Support
Entergy Operations, Inc.
P. O. Box 31995
Jackson, MS 39286-1995

Wise, Carter, Child & Caraway
P. O. Box 651
Jackson, MS 39205

ATTACHMENT TO LICENSE AMENDMENT NO. 226

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 6-14	3/4 6-14
3/4 6-15	3/4 6-15
B 3/4 6-3	B 3/4 6-3
B 3/4 6-5	B 3/4 6-5

CONTAINMENT COOLING SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.3 Two independent containment cooling groups shall be OPERABLE with two operational cooling units in each group.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one group of the above required containment cooling units inoperable and both containment spray systems OPERABLE, restore the inoperable group of cooling units to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With two groups of the above required containment cooling units inoperable and both containment spray systems OPERABLE, restore at least one group of cooling units to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore both above required groups of cooling units to OPERABLE status within 7 days of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With one group of the above required containment cooling units inoperable and one containment spray system inoperable, restore the inoperable spray system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore the inoperable group of containment cooling units to OPERABLE status within 7 days of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.2.3 Each containment cooling group shall be demonstrated OPERABLE:

a. At least once per 14 days by:

1. Verifying that service water flow rate to the group of cooling units is ≥ 1250 gpm and that each group has two operable fans.

2. Addition of a biocide to the service water during the surveillance in 4.6.2.3.a.1 above, whenever service water temperature is between 60°F and 80°F.

b. At least once per 31 days by:

1. Starting (unless already operating) each operational cooling unit from the control room.

2. Verifying that each operational cooling unit operates for at least 15 minutes.

c. At least once per 18 months by verifying that each cooling unit starts automatically on a CCAS test signal.

3/4.6.2 DEPRESSURIZATION, COOLING, AND pH CONTROL SYSTEMS

3/4.6.2.1 CONTAINMENT SPRAY SYSTEM

The OPERABILITY of the containment spray system ensures that containment depressurization and cooling capability will be available in the event of a LOCA. The pressure reduction and resultant lower containment leakage rate are consistent with the assumptions used in the accident analyses.

The containment spray system and the containment cooling system provide post accident cooling of the containment atmosphere; however, the containment cooling system is not redundant to the containment spray system. The containment spray system also provides a mechanism for removing iodine from the containment atmosphere and therefore the time requirements for restoring an inoperable spray system to OPERABLE status have been maintained consistent with that assigned other inoperable ESF equipment.

3/4.6.2.2 TRISODIUM PHOSPHATE (TSP)

A hydrated form of granular trisodium phosphate (TSP) is employed as a passive form of pH control for post LOCA containment spray and core cooling water to ensure that iodine, which may be dissolved in the recirculated reactor cooling water following a loss of coolant accident (LOCA), remains in solution. TSP also helps inhibit stress corrosion cracking (SCC) of austenitic stainless steel components in containment during the recirculation phase following an accident. Baskets of TSP are placed on the floor of the containment building to dissolve from released reactor coolant water and containment sprays after a LOCA. Recirculation of the water for core cooling and containment sprays then provides mixing to achieve a uniform solution pH.

Fuel that is damaged during a LOCA will release iodine in several chemical forms to the reactor coolant and to the containment atmosphere. A portion of the iodine in the containment atmosphere is washed to the sump by containment sprays. The emergency core cooling water is borated for reactivity control. This borated water causes the sump solution to be acidic. In a low pH (acidic) solution, dissolved iodine will be converted to a volatile form. The volatile iodine will evolve out of solution into the containment atmosphere, significantly increasing the levels of airborne iodine. The increased levels of airborne iodine in containment contribute to the radiological releases and increase the consequences from the accident due to containment atmosphere leakage.

After a LOCA, the components of the core cooling and containment spray systems will be exposed to high temperature borated water. Prolonged exposure to the core cooling water combined with stresses imposed on the components can cause SCC. The SCC is a function of stress, oxygen and chloride concentrations, pH, temperature, and alloy composition of the components. High temperatures and low pH, which would be present after a LOCA, tend to promote SCC. This can lead to the failure of necessary safety systems or components.

Adjusting the pH of the recirculation solution to levels above 7.0 prevents a significant fraction of the dissolved iodine from converting to a volatile form. The higher pH thus decreases the level of airborne iodine in containment and reduces the radiological consequences from containment atmosphere leakage following a LOCA. Maintaining the solution pH above 7.0 also reduces the occurrence of SCC of austenitic stainless steel components in containment. Reducing SCC reduces the probability of failure of components.

The SR 4.6.2.2.b requirement to dissolve a representative sample of TSP in a sample of borated water provides assurance that the stored TSP will dissolve in borated water at the postulated post-LOCA temperatures. Testing must be performed to ensure the solubility and buffering ability of the TSP after exposure to the containment environment. A representative sample of 3.09 ± 0.05 grams of TSP from one of the baskets in containment is submerged in 1.0 ± 0.01 liter of water at a boron concentration of 3130 ± 30 ppm and at a temperature of 120 ± 5°F. The solution is allowed to stand for 4 hours without agitation. The liquid is then decanted from the solution and mixed, the temperature adjusted to 77 ± 2°F and the pH measured. At this point, the pH must be ≥ 7.0. The representative sample weight is based on the minimum required TSP weight of 6804 kilograms, which at manufactured density corresponds to the minimum volume of 278 cubic ft, and assumed post LOCA borated water mass in the sump of approximately 4885000 lbm normalized to buffer a 1.0 liter sample. The boron concentration of the test water is representative of the maximum possible boron concentration corresponding to the calculated post LOCA sump volume producing the lowest pH. Agitation of the test solution is prohibited, since an adequate standard for the agitation intensity cannot be specified. The test time of 4 hours is necessary to allow time for the dissolved TSP to naturally diffuse through the sample solution. In the post LOCA containment sump, rapid mixing would occur, significantly decreasing the actual amount of time before the required pH is achieved. This would ensure compliance with the Standard Review Plan requirement of a pH ≥ 7.0 by the onset of recirculation after a LOCA.

3/4.6.2.3 CONTAINMENT COOLING SYSTEM

The OPERABILITY of the containment cooling system ensures that 1) the containment air temperature will be maintained within limits during normal operation, and 2) adequate heat removal capacity is available when operated in conjunction with the containment spray systems during post-LOCA conditions.

The containment spray system is redundant to the containment cooling system in providing post accident cooling of the containment atmosphere; however, the containment cooling system is not redundant to the containment spray system. As a result of the redundancy of the containment spray system with the containment cooling system, the allowable out-of-service time requirements for the containment cooling system have been appropriately adjusted. However, the allowable out of service time requirements for the containment spray system have been maintained consistent with that assigned other inoperable ESF equipment since the containment spray system also provides a mechanism for removing Iodine from the containment atmosphere.

The addition of a biocide to the service water system is performed during containment cooler surveillance to prevent buildup of Asian clams in the coolers when service water is pumped through the cooling coils. This is performed when service water temperature is between 60°F and 80°F since in this water temperature range Asian clams can spawn and produce larva which could pass through service water system strainers.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 226 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 June 29, 2000, as supplemented by letter dated October 4, 2000, Entergy Operations, Inc. (the licensee), submitted a request for changes to the Arkansas Nuclear One, Unit No. 2 (ANO-2), Technical Specifications (TSs). The requested changes would revise the containment cooling system TSs to require that two independent containment cooling groups are operable with two operational cooling units in each group, in Modes 1, 2, 3, and 4.

The October 4, 2000, supplement provided clarifying information that did not change the scope of the original application or the initial no significant hazards consideration determination.

2.0 BACKGROUND

The ANO-2 containment cooling system consists of two groups. Each group consists of two fan cooler units. The current ANO-2 TS 3/4.6.2.3, "Containment Cooling System," requires at least one operational fan cooler unit in each group.

By letter dated June 29, 2000, the licensee requested a change to TS 3/4.6.2.3 to increase the number of operational fan cooling units in each group from one to two. The licensee also responded by a letter dated October 4, 2000, to a staff request for additional information (RAI) made during a September 18, 2000, telephone conference call.

3.0 DISCUSSSION

The ANO-2 containment cooling system is designed to reduce the containment post accident pressure and temperature following a design basis accident (DBA). The design consists of two redundant containment cooling system groups with two fan cooling units in each group. The loss of a single group will result in the loss of two of a total of four fan cooling units.

During normal operation, the system is cooled by the non-safety related chilled water coils. Following a containment cooling actuation signal, cooling is accomplished by the service water

cooling coils. The service water piping configuration allows one of the two cooling units to be blanked off. This was acceptable through Cycle 14 and allowed by the current TSs, since analyses indicated that only one cooling unit could provide adequate cooling during a DBA.

The licensee is proposing the replacement of both ANO-2 steam generators (SGs) prior to startup for Cycle 15 operation with SGs that contain larger primary and secondary water volumes, have a greater heat transfer area, and a higher secondary side operating pressure. In addition, the licensee is planning to later increase the reactor power by 7.5 percent. These changes have necessitated the increase in the containment design pressure from 54 psig to 59 psig. Because of this increase in the containment design pressure, the licensee intends to modify the fan blade pitch in order to limit the containment cooler fan horsepower to its existing capacity. The increased design conditions and the change in fan blade pitch will reduce the design heat removal capacity of a given cooling unit by approximately 35 percent below its original design requirements. As a result, the new fan pitch will require two fans per group to be operable to ensure that the heat removal assumptions in the analyses of DBAs are bounded. The licensee states that having two cooling units per group operable will ensure more than adequate margin for the design basis heat removal capacity.

4.0 EVALUATION

The licensee has performed calculations of peak containment pressure and temperature following the worst case loss-of-coolant accident (LOCA) and a main steam line break (MSLB) with the replacement SGs and 7.5 percent increase in reactor power. These calculations were provided to the staff in letters dated November 3, 1999, and June 29, 2000. The licensee also responded to staff questions in an August 16, 2000, letter. These calculations assumed that one group (two units) of the containment cooling fan units was in operation following initiation of the LOCA and the MSLB. This is consistent with the licensee's proposed TS change (assuming a single failure of one group of the containment cooling system). The staff has reviewed these calculations and has found them to be acceptable in the Safety Evaluation associated with License Amendment No. 225, dated November 13, 2000.

Nuclear Regulatory Commission (NRC or the Commission) Inspection Report 50-319/99-09; 50-368/99-09 identified the use of a non-conservative fouling factor for the fan cooler units in heat transfer calculations and the possibility of flashing (two-phase flow) if the assumption of clean tubes with no fouling (and therefore increased heat transfer to the service water) is made. Although there may be some fouling, the licensee states that the amount cannot be quantified. Therefore, the conservative no-fouling assumption is made.

The licensee's October 4, 2000, supplemental letter states that this issue is being addressed under ANO-2's Corrective Action Program. As part of this TS change to increase the required number of fan cooler units, the licensee performed calculations to determine the effect on heat removal capability of possible flashing (two-phase flow) in the service water coolers with the assumption of clean (no fouling) tubes. The licensee states that, although more severe environmental conditions associated with the SG replacement and the power uprate tend to increase the potential for flashing, this effect is mitigated by the proposed reduction in air flow across the containment cooler coils. Thus, the presence of flashing is due solely to the conservative assumption of clean service water tubes.

The licensee's calculations are described in the licensee's supplemental letter to the staff dated October 4, 2000. The licensee performed detailed calculations of the behavior of the containment cooling system fan cooler units and found that there would be two phase flow of the service water in the fan cooler units for a limited time after accident initiation. These calculations modeled the fan cooler units with the GOTHIC containment computer code.

The possibility of flashing, or two phase flow, in the containment fan cooling units discussed above is a change from the licensee's response to Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design Basis Accident Conditions." The NRC's consultant's report on the licensee's reply to GL 96-06, that was an enclosure to NRC's letter dated February 7, 2000, states that "there is no mechanism to sustain two-phase flow that degrades the performance of the fan coolers." Although the potential for two phase flow will increase with the conservative no-fouling assumption, the staff concludes, based on the information in the licensee's October 4, 2000, supplemental letter, that the performance of the fan coolers will still not be degraded. This is because the October 4, 2000, supplemental letter demonstrates that there is margin between the heat removal capability of the fan cooler units, even with flashing, and the calculated heat load following a DBA. Therefore, the staff finds that the containment cooling system will perform its intended function following a DBA.

5.0 EVALUATION SUMMARY

The staff finds the licensee's proposed change to the TSs, to increase the required number of operational cooling units in each of two groups to be operable, from one to two, to be acceptable. This change is consistent with the accident analysis for ANO-2.

6.0 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.

7.0 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 (65 FR 46008, dated July 26, 2000). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

8.0 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. Lobel

Date: November 13, 2000