March 31, 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. 1 - ISSUANCE OF AMENDMENT RE: SODIUM HYDROXIDE TANK LIMITS (TAC NO. MA2494)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 205 to Facility Operating License No. DPR-51 for Arkansas Nuclear One, Unit No. 1. The amendment consists of changes to the Technical Specifications in response to your application dated August 6, 1998 (1CAN089801), as supplemented by letter dated February 16, 2000 (1CAN020004).

The amendment revises the minimum and the maximum concentration limits for the sodium hydroxide tank. The amendment also deletes the maximum specified tank volume and revises the minimum specified tank volume to refer to the parameter used in the safety analysis with no allowance for instrument uncertainty.

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/
M. Christopher Nolan, Project Manager, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosures: 1. Amendment No. 205 to DPR-51
2. Safety Evaluation

cc w/encls: See next page

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

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Mr. Craig G. Anderson
Vice President, Operations ANO
Entergy Operations, Inc.
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M. Christopher Nolan, Project Manager, Section 1
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Docket No. 50-313

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2. Safety Evaluation

cc w/encls: See next page

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& Chief Operating Officer
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ENTERGY OPERATIONS INC.

DOCKET NO. 50-313

ARKANSAS NUCLEAR ONE, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 205
License No. DPR-51

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee) dated August 6, 1998, as supplemented by letter dated February 16, 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 hereby amended to approve the relocation of certain Technical Specification requirements to licensee-controlled documents, as described in the Licensee's application dated August 6, 1998, as supplemented by letter dated February 16, 2000, and reviewed in the Staff's safety evaluation report dated March 31, 2000. This license is also hereby 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. DPR-51 is hereby amended to read as follows:

   2. Technical Specifications

      The Technical Specifications contained in Appendix A, as revised through Amendment No. 205, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days from the date of issuance. Implementation shall include the relocation of Technical Specification requirements to the appropriate licensee-controlled document as identified in the Licensee's application dated August 6, 1998, as supplemented by letter dated February 16, 2000, and reviewed in the Staff's safety evaluation report dated March 31, 2000.

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: March 31, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 205

FACILITY OPERATING LICENSE NO. DPR-51

DOCKET NO. 50-313

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
37	37
39	39

(I) The engineered safety features valves associated with each of the above systems shall be operable or locked in the ES position.

3.3.2 In addition to 3.3.1 above, the following ECCS equipment shall be operable when the reactor coolant system is above 350F and irradiated fuel is in the core:

(A) Two out of three high pressure injection (makeup) pumps shall be maintained operable, powered from independent essential buses, to provide redundant and independent flow paths.

(B) Engineered safety features valves associated with 3.3.2.a above shall be operable or locked in the ES position.

3.3.3 In addition to 3.3.1 and 3.3.2 above, the following ECCS equipment shall be operable when the reactor coolant system is above 800 psig:

(A) The two core flooding tanks shall each contain an indicated minimum of 13 ± 0.4 feet (1040 ± 30 ft^3) of borated water at 600 ± 25 psig.

(B) Core flooding tank boron concentration shall not be less than 2270 ppm boron.

(C) The electrically operated discharge valves from the core flood tanks shall be open and breakers locked open and tagged.

(D) One of the two pressure instrument channels and one of the two level instrument channels per core flood tank shall be operable.

3.3.4 The reactor shall not be made critical unless the following equipment in addition to 3.3.1, 3.3.2, and 3.3.3 above is operable.

(A) Two reactor building spray pumps and their associated spray nozzle headers and two trains of reactor building emergency cooling. The two reactor building spray pumps shall be powered from operable independent emergency buses and the two reactor building emergency cooling trains shall be powered from operable independent emergency buses.

(B) The sodium hydroxide tank shall contain a volume of ≥9,000 gallons of sodium hydroxide solution at a concentration >5.0 wt% and <16.5 wt%.

(C) All manual valves in the main discharge lines of the sodium hydroxide tanks shall be locked open.

370,100 gallons of borated water are supplied for emergency core cooling and reactor building spray in the event of a loss-of-coolant accident. This amount fulfills requirements for emergency core cooling. Approximately 16,000 gallons of borated water are required to reach cold shutdown. The original nominal borated water storage tank capacity of 380,000 gallons is based on refueling volume requirements. Heaters maintain the borated water supply at a temperature to prevent crystallization and local freezing of the boric acid. The minimum required BWST boron concentration of 2270 ppm assures that the core will be maintained at least 1 percent $\Delta k/k$ subcritical at 70°F without any control rods in the core.

Specification 3.3.2 assures that above 350°F two high pressure injection pumps are also available to provide injection water as the energy of the reactor coolant system is increased.

Specification 3.3.3 assures that above 800 psig both core flooding tanks are operational. Since their design pressure is 600 ± 25 psig, they are not brought into the operational state until 800 psig to prevent spurious injection of borated water. Both core flooding tanks are specified as a single core flood tank has insufficient inventory to reflood the core.(1)

Specification 3.3.4 assures that prior to going critical the redundant train of reactor building emergency cooling and spray train are operable.

The spray system utilizes common suction lines with the low pressure injection system. If a single train of equipment is removed from either system, the other train must be assured to be operable in each system.

The volume specified by 3.3.4.B is the safety analysis volume and does not contain allowances for instrument uncertainty. 9,000 gallons corresponds to a level of approximately 26 feet at a temperature of 77°F and a NaOH concentration of 5.0 wt%. No maximum volume is specified as the value used as the maximum volume in the safety analysis bounds the physical size of the NaOH tank. Additional allowances for instrument uncertainties, as determined in Reference 6, are incorporated in the operating procedures associated with the level instrumentation used in the control room.

When the reactor is critical, maintenance is allowed per Specification 3.3.5. Operability of the specified components shall be based on the results of testing as required by Technical Specification 4.5. The maintenance period of up to 24 hours is acceptable if the operability of equipment redundant to that removed from service is demonstrated within 24 hours prior to removal. Exceptions to Specification 3.3.6 permit continued operation for seven days if one of two BWST level instrument channels is operable or if either the pressure or level instrument channel in the CFT instrument channel is operable.

In the event that the need for emergency core cooling should occur, functioning of one train (one high pressure injection pump, one low pressure injection pump, and both core flooding tanks) will protect the core and in the event of a main coolant loop severance, limit the peak clad temperature to less than 2200°F and the metal-water reaction to that representing less than 1 percent of the clad.

The service water system consists of two independent but interconnected, full capacity, 100% redundant systems, to ensure continuous heat removal.(4)

One service water pump is required for normal operation. The normal operating requirements are greater than the emergency requirements following a loss-of-coolant accident.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 205 TO

FACILITY OPERATING LICENSE NO. DPR-51

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 1

DOCKET NO. 50-313

1.0 INTRODUCTION

By letter dated August 6, 1998 (1CAN089801), as supplemented by letter dated February 16, 2000 (1CAN020004), Entergy Operations, Inc. (the licensee), submitted a request for change to the Arkansas Nuclear One, Unit 1 (ANO-1), Technical Specifications (TSs). The requested change would revise the minimum and the maximum concentration limits for the sodium hydroxide contained in the containment spray (CS) additive tank. The requested change would also delete the maximum specified tank volume and relocate the treatment of this parameter to the TS Bases. Finally, this change would revise the minimum specified tank volume, express this volume in terms of gallons rather then level, and utilize a limit derived directly from the safety analysis with no allowance for instrument uncertainty. The treatment of instrument uncertainties would be relocated to licensee controlled operating procedures and discussed in the TS Bases. The changes to the concentration limits and the minimum tank volume are needed to maintain the proper value of pH in the CS and containment sump water during loss-of-coolant accident (LOCA) conditions. In addition, the Nuclear Regulatory Commission (NRC) provided guidance to all holders of operating licenses or construction permits for nuclear reactors on the proposed TS changes in Generic Letter 95-10, "Relocation of Selected Technical Specification Requirements Related to Instrumentation," dated December 15, 1995.

The February 16, 2000, letter provided clarifying information that did not change the scope of the August 6, 1998, application and the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

Section 182a of the Atomic Energy Act of 1954, as amended (the Act), requires applicants for nuclear power plant operating licenses to include TS as part of the license. The Commission's regulatory requirements related to the content of TS are set forth in 10 CFR 50.36. That regulation requires that the TS include items in five specific categories, including (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; and (5) administrative controls.

Section 50.36(c)(2)(ii) of Title 10 of the *Code of Federal Regulations* requires TS limiting conditions for operation that meet any of the following criteria must be established:

(A) Criterion 1. Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

(B) Criterion 2. A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

(C) Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

(D) Criterion 4. A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.

As a result, existing TS requirements which fall within or satisfy any of the criteria must be retained in the TS, while those TS requirements which do not fall within or satisfy these criteria may be relocated to other, licensee-controlled documents.

3.0 DISCUSSION

The change in maximum and minimum limits for the sodium hydroxide concentration in the CS additive tank is needed because in the present specification, the corresponding values of pH in the CS and containment sump water were calculated at a post-accident containment temperature of 200 °F, instead of a standard reference temperature of 77 °F. Since the value of pH increases with decreasing temperature, and higher pH improves iodine retention in the sump water, using the higher containment temperature made the calculated values of pH more conservative for sump iodine retention capability. However, the calculated values were less conservative for equipment degradation because higher pH increases equipment degradation rates due to caustic attack. The proposed changes to sodium hydroxide concentration limits in the CS additive tank will ensure that the CS and sump water will be maintained at correct values of pH during LOCA conditions.

4.0 EVALUATION

ANO-1 uses sodium hydroxide solution as a CS additive to maintain the pH of the spray and containment sump water in an alkaline range so that the stress corrosion cracking of stainless steel components will be minimized and the radioactive iodine removed from the containment atmosphere will be retained in the sump water. However, pH should be kept below the value at which degradation of equipment could occur. The current concentrations of sodium hydroxide corresponding to the pH range of 8.5 to 10.5 are 15 weight percent and 20.8 weight percent, respectively. In the present TSs, these concentrations were determined assuming that the corresponding pH values were calculated at a containment atmosphere temperature of 200 °F.

This assumption was incorrect; however, as the pH value limits for corrosion, iodine retention, and equipment qualification were determined at 77 °F, the resulting errors were conservative for iodine retention and nonconservative for corrosion and equipment qualification. Based on the current limits in TS 3.3.4(B), the maximum pH value could have been as high as 11.5 when adjusted to 77 °F. The licensee has imposed administrative controls to ensure that the recirculation sump volume would not exceed a pH of 10.5 at 77 °F while remaining within the limits of TS 3.3.4(B). In order to correct this condition, the licensee proposes to revise TS 3.3.4(B) to change the minimum concentration of sodium hydroxide in the spray additive tank to 5 weight percent and the maximum concentration to 16.5 weight percent, and specify the minimum volume of the sodium hydroxide solution in the tank as 9,000 gallons. The spray additive tank range of concentrations and fluid levels are used to determine sump/spray pH values to ensure that adequate iodine removal occurs to limit offsite doses and to ensure that equipment coming in contact with the fluid will continue to operate for the duration of the accident. With pH values calculated at a temperature of 77 °F, the new pH range is 7 to 10.5. The changes are acceptable to the staff.

The licensee has determined that when 4,000 gallons of liquid from the spray additive tank are added to the water coming from other sources, enough liquid is accumulated in the reactor building to keep the liquid level in the reactor building sump above the minimum required for operation of the low pressure injection and reactor building spray pumps. In order to ensure a minimum contribution of 4,000 gallons from the spray additive tank, a minimum volume of 9,000 gallons of liquid in the tank is required. The licensee proposes to specify the minimum required volume in TS 3.3.4(B). The amount of liquid from the additive tank needed to prevent exceeding the maximum allowed liquid level of water in the reactor building was bounded by the maximum volume of the tank; therefore, there was no need to specify a maximum volume in the TS. As a result, the licensee proposes to delete the maximum volume from the TS. The changes are acceptable to the staff.

In addition, the licensee proposes to revise TS 3.3.4(B) to specify the required amount of sodium hydroxide solution in terms of tank volume rather than tank level. The licensee proposes to change the Bases associated with TS 3.3.4(B) to equate levels to analytical volumes and to state that allowances for instrument inaccuracies must be applied to the values when implemented in the plant. The licensee proposes to control changes due to instrument inaccuracies administratively. Future changes, which may be caused by instrument replacement, could be made under the plant's 10 CFR 50.59 evaluation process rather than by a TS amendment. Therefore, these changes are acceptable to the staff.

The maximum and minimum volumes of sodium hydroxide contained in the CS additive tank are process variables that establish an initial condition of a design basis accident that assumes a failure of a fission product barrier and are applicable to Criterion 2 of 10 CFR 50.36. The initial volume of sodium hydroxide contained in the CS additive tank controls the pH of the containment spray water and the final pH of the containment sump liquid volume following a LOCA. The licensee's proposed change to reduce the maximum allowable concentration of the sodium hydroxide contained in the CS additive tank results in a condition in which the physical size of the tank would preclude the addition of sufficient quantities of sodium hydroxide to exceed the upper pH limit. Thus, the maximum volume limit of the CS additive tank would no longer satisfy Criterion 2 of 10 CFR 50.36 for the licensee's proposal. Therefore, the licensee's proposal to remove the maximum volume limit from TS 3.3.4(B) is acceptable. The licensee has located a discussion of the bases for the treatment of this parameter in the applicable TS

Bases. It is recognized that the NRC's conclusion that the spray additive tank maximum volume limit does not meet Criterion 2 of 10 CFR 50.36 and can be removed from TS 3.3.4(B) is based on the current analysis and the size of the existing tank. The NRC realizes that, however unlikely, this tank could be replaced in the future with a larger capacity tank. In it's letter dated February 16, 2000, the licensee addressed this concern and has committed to re-establish a maximum volume limit in the TSs for this tank if conditions change, such that the maximum usable storage volume of sodium hydroxide exceeded the analytical value corresponding to the maximum allowable sump pH following a LOCA.

The licensee's proposal would change the minimum tank volume limit from a tank level to a limit expressed in gallons. In addition, the licensee has indicated that this new volume limit represents the analytical value. The correlation of this limit to a tank level and the treatment of instrument uncertainties will be relocated to the licensee's operating procedures. A discussion of this treatment is contained in the applicable TS Bases, as indicated in the licensee's proposal. The analytical limit for the CS additive tank minimum volume for sodium hydroxide satisfies Criterion 2 of 10 CFR 50.36. However, the instrument uncertainties are applicable to the individual instrument used for measurement and is a static adjustment to an initial condition that does not impact equipment performance during a response to a transient. Thus, for this condition, instrument uncertainties do not constitute a process variable. Therefore, the staff finds that the relocation of instrument uncertainties to the licensee's operating procedures, which are described in the safety analysis report, is acceptable.

The licensee evaluated the effect that a change in the concentration and the amount of sodium hydroxide in the spray additive tank could have on removal of radioactive iodine from the containment atmosphere due to an impact on the iodine decontamination factor. The licensee calculated the new iodine decontamination factor and found that it was unchanged from the old factor. Therefore, the ability to remove iodine from the containment atmosphere was not affected by the proposed changes to the TSs. In addition, the proposed change would result in a reduction in total sodium hydroxide discharge to the reactor building sump from 10,048 gallons to a value greater than 4,000 gallons. Offsite dose consequences are not impacted by this reduction in sump volume and corresponding increase in sump water iodine concentration due to the existing conservatism in the licensee's dose calculations. Therefore, there are no adverse dose consequences as a result of this change.

The staff reviewed the assumptions and methodologies used by the licensee in their analyses to justify the requested TS changes. The staff also performed an independent verification of the licensee's calculations. The staff found that the changes were well supported by the licensee's analyses.

The staff reviewed the revisions to the TSs for ANO-1, proposed by the licensee. The revisions include changing the concentration of sodium hydroxide in the spray additive tank, specifying a new minimum volume of the solution in the spray additive tank, removing the specification for maximum volume, and administratively controlling the application of instrument inaccuracies to the tank level instrumentation. Based on its review, the staff concludes that the TS changes are acceptable.

5.0 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.

6.0 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 (64 FR 6695 dated February 10, 1999). 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.

7.0 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: K. Parczewski
C. Nolan

Date: March 31, 2000