October 24, 1994

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

SUBJECT: ISSUANCE OF AMENDMENT NO. 174 TO FACILITY OPERATING LICENSE NO. DPR-51 - ARKANSAS NUCLEAR ONE, UNIT NO. 1 (TAC NO. M88622)

Dear Mr. Yelverton:

The Commission has issued the enclosed Amendment No. 174 to Facility Operating License No. DPR-51 for the Arkansas Nuclear One, Unit No. 1 (ANO-1). This amendment consists of changes to the Technical Specifications (TS) in response to your application dated January 13, 1994.

The amendment revises the specifications governing the reactor protection system (RPS) to permit the plant to operate indefinitely with one RPS channel in by-pass.

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:
George Kalman, Senior Project Manager
Project Directorate IV-1
Division of Reactor Projects - III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosures: 1. Amendment No. 174 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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2. Safety Evaluation

cc w/encls: See next page

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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. 174
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 January 13, 1994, 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. DPR-51 is hereby amended to read as follows:

   2. Technical Specifications

      The Technical Specifications contained in Appendix A, as revised through Amendment No. 174, 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
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: October 24, 1994

ATTACHMENT TO LICENSE AMENDMENT NO. 174

FACILITY OPERATING LICENSE NO. DPR-51

DOCKET NO. 50-313

Replace 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
42	42
43	43
43a	43a
43b	43b
45e	45e

3.5 INSTRUMENTATION SYSTEMS

3.5.1 Operational Safety Instrumentation

Applicability

Applies to unit instrumentation and control systems.

Objectives

To delineate the conditions of the unit instrumentation and safety circuits necessary to assure reactor safety.

Specifications

3.5.1.1 Startup and operation are not permitted unless the requirements of Table 3.5.1-1, columns 3 and 4 are met.

3.5.1.2 In the event the number of protection channels operable falls below the limit given under Table 3.5.1-1, Columns 3 and 4, operation shall be limited as specified in Column 5.

3.5.1.3 For on-line testing or in the event of a protection instrument or channel failure, a key operated channel bypass switch associated with each reactor protection channel may be used to lock the channel trip relay in the untripped state as indicated by a light. Only one channel shall be locked in the untripped state or contain inoperable functions in the untripped state at any one time. In the event more than one protection channel contains inoperable functions in the untripped state, or a protection channel or function becomes inoperable concurrent with another protection channel locked in the untripped state, within 1 hour implement the actions required by Table 3.5.1-1 Note 6. Only one channel bypass key shall be accessible for use in the control room. While operating with an inoperable function unbypassed in the untripped state, the remaining RPS key operated channel bypass switches shall be tagged to prevent their operation.

3.5.1.4 The key operated shutdown bypass switch associated with each reactor protection channel shall not be used during reactor power operation except during channel testing.

3.5.1.5 During startup when the intermediate range instruments come on scale, the overlap between the intermediate range and the source range instrumentation shall not be less than one decade. If the overlap is less than one decade, the flux level shall be maintained in the source range until the one decade overlap is achieved.

3.5.1.6 In the event that one of the trip devices in either of the sources supplying power to the control rod drive mechanisms fails in the untripped state, the power supplied to the rod drive mechanisms through the failed trip device shall be manually removed within 30 minutes following detection. The condition will be corrected and the remaining trip devices shall be tested within eight hours following detection. If the condition is not corrected and the remaining trip devices are not tested within the eight-hour period, the reactor shall be placed in the hot shutdown condition within an additional four hours.

Bases

Every reasonable effort will be made to maintain all safety instrumentation in operation. A startup is not permitted unless the requirements of Table 3.5.1-1, Columns 3 and 4, are met.

Operation at rated power is permitted as long as the systems have at least the redundancy requirements of Column 4 (Table 3.5.1-1). This is in agreement with redundancy and single failure criteria of IEEE 279 as described in FSAR, Section 7.

There are four reactor protection channels. Normal trip logic is two out of four. Required trip logic for the power range instrumentation channels is two out of three. Minimum trip logic on other instrumentation channels is one out of two.

The four reactor protection channels were provided with key operated bypass switches to allow on-line testing or maintenance on only one channel at a time during power operation. Each channel is provided with alarm and lights to indicate when that channel is bypassed. There will be one reactor protection system channel bypass switch key permitted in the control room. Upon the discovery of inoperable functions in any one reactor protection channel, the effect of the failure on the reactor protection system and other interconnected systems is evaluated. The affected reactor protection channel may be placed in channel bypass, remain in operation in a degraded condition, or placed in the tripped condition as determined by operating conditions and management judgment. This action allows placing the plant in the safest condition possible considering the extent of the failure, plant conditions, and guidance from plant management. Should the failure in the reactor protection channel prohibit the proper operation of another system, the appropriate actions for the affected system are implemented. Administrative controls are established to preclude placing a reactor protection channel in channel bypass when any other reactor protection channel contains an inoperable function in operation in the untripped state.

Each reactor protection channel key operated shutdown bypass switch is provided with alarm and lights to indicate when the shutdown bypass switch is being used.

The source range and intermediate range nuclear flux instrumentation scales overlap by one decade. This decade overlap will be achieved at 10^{-10} amps on the intermediate range scale.

The ESAS employs three independent and identical analog channels, which supply trip signals to two independent, identical digital subsystems. In order to actuate the safeguards systems, two out of three analog channels must trip. This will cause both digital subsystems to trip. Tripping of either digital subsystem will actuate all safeguards systems associated with that digital subsystem.

Because only one digital subsystem is necessary to actuate the safeguards systems and these systems are capable of tripping even when they are being tested, a single failure in a digital subsystem cannot prevent protective action.

Removal of a module required for protection from a RPS channel will cause that channel to trip, unless that channel has been bypassed, so that only one channel of the other three must trip to cause a reactor trip. Thus, sufficient redundancy has been built into the system to cover this situation.

Removal of a module required for protective action, from an analog ESAS channel will cause that channel to trip, so that only one of the other two must trip to actuate the safeguards systems. Removal of a module required for protective action from a digital ESAS subsystem will not cause that subsystem to trip. The fact that a module has been removed will be continuously annunciated to the operator. The redundant digital subsystem is still sufficient to indicate complete ESAS action.

The testing schemes of the RPS, the ESAS, and the EFIC enables complete system testing while the reactor is operating. Each channel is capable of being tested independently so that operation of individual channels may be evaluated.

The EFIC is designed to allow testing during power operation. One channel may be placed in key locked "maintenance bypass" prior to testing. This will bypass only one channel of EFW initiate logic. An interlock feature prevents bypassing more than one channel at a time. In addition, since the EFIC receives signals from the NI/RPS, the maintenance bypass from the NI/RPS is interlocked with the EFIC. If one channel of the NI/RPS is in maintenance bypass, only the corresponding channel of EFIC may be bypassed. Prior to placing a channel of EFIC in maintenance bypass, any NI/RPS channel containing inoperable functions in the untripped state is evaluated for its effect on EFIC. Only the EFIC channel corresponding to the NI/RPS channel containing the inoperable function may be placed in maintenance bypass unless it can be shown that the failure in the NI/RPS channel has no effect on EFIC actuation, actions are taken to ensure EFIC actuation when required, or the appropriate actions of Table 3.5.1-1 are implemented. The EFIC can be tested from its input terminals to the actuated device controllers. A test of the EFIC trip logic will actuate one of two relays in the controllers. Activation of both relays is required in order to actuate the controllers. The two relays are tested individually to prevent automatic actuation of the component. The EFIC trip logic is two (one-out-of-two).

Reactor trips on loss of all main feedwater and on turbine trips will sense the start of a loss of OTSG heat sink and actuate earlier than other trip signals. This early actuation will provide a lower peak RC pressure during the initial over pressurization following a loss of feedwater or turbine trip event. The LOFW trip may be bypassed up to 10% to allow sufficient margin for bringing the MFW pumps into use at approximately 7%. The Turbine Trip may be bypassed up to 45% based on BAW-1893, "Basis for Raising Arming Threshold for Anticipatory Reactor Trip on Turbine Trip," October 1985 and the NRC Safety Evaluation Report for BAW-1893 issued from Mr. D. M. Crutchfield to Mr. J. H. Taylor via letter dated April 25, 1986.

The Automatic Closure and Isolation System (ACI) is designed to close the Decay Heat Removal System (DHRS) return line isolation valves when the Reactor Coolant System (RCS) pressure exceeds a selected fraction of the DHRS design pressure or when core flooding system isolation valves are opened. The ACI is designed to permit manual operation of the DHRS return line isolation valves when permissive conditions exist. In addition, the ACI is designed to disallow manual operation of the valves when permissive conditions do not exist.

Power is normally supplied to the control rod drive mechanisms from two separate parallel 480 volt sources. Redundant trip devices are employed in each of these sources. If any one of these trip devices fails in the untripped state, on-line repairs to the failed device, when practical, will be made and the remaining trip devices will be tested. Four hours is ample time to test the remaining trip devices and, in many cases, make on-line repairs.

The Degraded Voltage Monitoring relay settings are based on the short term starting voltage protection as well as long term running voltage protection. The 4.16 KV undervoltage relay setpoints are based on the allowable starting voltage plus maximum system voltage drops to the motor terminals, which allows approximately 78% of motor rated voltage at the motor terminals. The 460V undervoltage relay setpoint is based on long term motor voltage requirements plus the maximum feeder voltage drop allowance resulting in a 92% setting of motor rated voltage.

The OPERABILITY of the accident monitoring instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess these variables during and following an accident. This capability is consistent with the recommendation of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident," December 1975 and NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations."

The OPERABILITY of the chlorine detection system ensures that sufficient capability is available to promptly detect and initiate protective action in the event of an accidental chlorine release. This capability is required to protect control room personnel and is consistent with the recommendations of Regulatory Guide 1.95, "Protection of Nuclear Power Plant Control Room Operators against an Accidental Chlorine Release," February 1975.

The subcooled margin monitors (SMM), and core-exit thermocouples (CET), Reactor Vessel Level Monitoring System (RVLMS) and Hot Leg Level Measurement System (HLLMS) are a result of the Inadequate Core Cooling (ICC) instrumentation required by Item II.F.2 NUREG-0737. The function of the ICC instrumentation is to increase the ability of the plant operators to diagnose the approach to and recovery from ICC. Additionally, they aid in tracking reactor coolant inventory. These instruments are included in the Technical Specifications at the request of NRC Generic Letter 83-37 and are not required by the accident analysis, nor to bring the plant to cold shutdown conditions. The Reactor Vessel Level Monitor is provided as a means of indicating level in the reactor vessel during accident conditions. The channel operability of the RVLMS is defined as a minimum of three sensors in the upper plenum region and two sensors in the dome region operable. When Reactor Coolant Pumps are running, all except the dome sensors are interlocked to read "invalid" due to flow induced variables that may offset the sensor outputs. The channel operability of the HLLMS is defined as a minimum of one wide range and any two of the narrow range transmitters in the same channel operable. If the equipment is inaccessible due to health and industrial safety concerns (for example, high radiation area, low oxygen content of the containment atmosphere) or due to physical location of the fault (for example, probe failure in the reactor vessel), then operation may continue until the next scheduled refueling outage and a report filed.

TABLE 3.5.1-1 (Cont'd)

Notes:

1. Initiate a shutdown using normal operating instructions and place the reactor in the hot shutdown condition within 12 hours if the requirements of Columns 3 and 4 are not met.

2. When 2 of 4 power range instrument channels are greater than 10% rated power, hot shutdown is not required.

3. When 1 of 2 intermediate range instrument channels is greater than 10-10 amps, hot shutdown is not required.

4. For channel testing, calibration, or maintenance, the minimum number of operable channels may be two and a degree of redundancy of one for a maximum of four hours, after which Note 1 applies.

5. If the requirements of Columns 3 or 4 cannot be met within an additional 48 hours, place the reactor in the cold shutdown condition within 24 hours.

6. The minimum number of operable channels may be reduced to 2, provided that the system is reduced to 1 out of 2 coincidence by tripping the remaining channel. Otherwise, the actions required by Column 5 shall apply.

7. These channels initiate control rod withdrawal inhibits not reactor trips at -10% rated power. Above 10% rated power, those inhibits are bypassed.

8. If any one component of a digital subsystem is inoperable, the entire digital subsystem is considered inoperable. Hence, the associated safety features are inoperable and Specification 3.3 applies.

9. The minimum number of operable channels may be reduced to one and the minimum degree of redundancy to zero for a maximum of 24 hours, after which Note 1 applies.

10. With the number of operable channels less than required, either restore the inoperable channel to operable status within 30 days, or be in hot shutdown within 12 hours.

11. With the number of operable channels less than required, isolate the electromatic relief valve within 4 hours, otherwise Note 9 applies.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 174 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 January 13, 1994, Entergy Operations, Inc. proposed changes to the Arkansas Nuclear One, Unit 1 (ANO-1) technical specifications (TSs) for Operating License No. DRP-51. The proposed changes would allow plant operation to continue indefinitely with one Reactor Protection System (RPS) channel placed in bypass. TS 3.5.1.3, the associated Bases for TS 3.5.1.3, TS 3.5.1.11, and TS Table 3.5.1-1 would be modified to allow this action.

By letter dated July 8, 1992, the staff approved Supplement 2 of Babcock and Wilcox Owners Group (BWOG) Topical Report BAW-10167, "Justification for Increasing the Reactor Trip System On-Line Test Interval-Additional Information on Allowed Outage Time". In the July 8, 1992, letter the staff approved placing one RPS channel in the bypassed state for an indefinite period for repairs and the licensee's proposed TS changes are based on this topical report. The proposed changes would:

1. Allow plant operation to continue indefinitely with one RPS channel in bypass.

2. Add additional requirements to ensure that only one RPS channel may be placed in channel bypass or contain inoperable functions or components in the untripped state.

3. Add conservative requirements for conditions that involve multiple failures.

4. Add Bases discussion of requirements upon discovery of inoperable functions or components in the RPS and available options for operating the RPS with inoperable functions.

5. Add Bases discussion of operation of Emergency Feedwater Initiation and Control (EFIC) system maintenance bypass when any one RPS channel contains inoperable functions in the untripped state.

2.0 BACKGROUND

The ANO-1 RPS consists of four identical protection channels that operate in a two-out-of-four configuration. A trip in any two of the four channels would initiate a trip of all control rod power supply breakers and contactors.

Each channel is provided with a channel bypass key switch. The channel bypass switch enables a channel to be bypassed without initiating a trip. The bypass switch is normally used to bypass one channel during on-line testing. Thus, during on-line testing the system would operate in a two-out-of-three configuration. The channel bypass switches are interlocked. Therefore, if one channel bypass switch is in bypass, the other channel bypass switches would be locked out.

When an RPS channel is bypassed, all functions in the channel are prevented from providing a trip signal. However, the monitoring functions of the channel are not removed from service, but the trip logic is altered from a two-out-of-four configuration to a two-out-of-three configuration. When an RPS channel is placed in the tripped mode, all functions in the channel provide a trip signal. The monitoring functions of the channel are removed from service and the trip logic is altered from a two-out-of-four configuration to a one-out-of-three configuration.

The BWOG topical report evaluated the two-out-of-three and one-out-of-three configurations. The BWOG evaluation indicated that the two-out-of-three configuration provides acceptable reliability to trip on demand as well as protection against spurious trips. The one-out-of-three configuration is intolerant of single spurious trips. In addition, testing the one-out-of-three configuration in the tripped mode requires more human actions to switch the channel from tripped to bypass mode and back again and, therefore, increases the susceptibility of the RPS trip logic to human error and thus may contribute to a higher RPS spurious trip rate. The BWOG evaluation concluded that extended operation with an inoperable channel in bypass was safer than operation with the inoperable channel in the tripped mode.

3.0 EVALUATION

Currently TS 3.5.1.3 requires that if a RPS channel is undergoing on-line testing or any protection instrument or channel fails, the RPS channel shall be placed in channel bypass.

The licensee has proposed changes that would allow the optional use of the channel bypass switch. Changes to TS 3.5.1.3 and the associated Bases for TS 3.5.1.3 would allow a single inoperable channel to be placed in channel bypass, in the manually tripped state, or to remain in operation in a degraded condition as determined by evaluation, plant conditions, and management

approval. These changes would also allow a channel undergoing testing to be placed in either channel bypass or in the manually tripped state as determined by existing plant conditions and management review. To preserve the minimum trip logic of the two-out-of-three configuration, the licensee has proposed that TS 3.5.1.3 be further revised to require that only one channel shall be locked in the untripped state at any one time.

The licensee has also proposed to modify TS 3.5.1.3 to require the operator to tag the remaining channel bypass switches when operating with an inoperable function bypassed in the untripped state. This requirement ensures that one of the remaining channels will not be placed in bypass without prior management approval consistent with the requirements of TS Table 3.5.1-1.

Upon discovery of an inoperable component or function in any channel, the condition would be evaluated for channel and system operability as required by existing plant administrative procedures and TSs. This review would look at both the failure itself and an evaluation of the effect of the failure on interconnected systems. Should this evaluation determine that the failure would prevent the functioning of another system, the appropriate actions for the additional affected system would be implemented.

TS Table 3.5.1-1 calls for the minimum number of operable channels to be three for the following:

High Pressure Injection System
reactor coolant pressure instrument channels and
reactor building 4 psig instrument channels

Low Pressure Injection System
reactor coolant pressure instrument channels and
reactor building 4 psig instrument channels

Reactor Building Isolation
reactor building 4 psig instrument channels

Reactor Building Cooling System
reactor building 4 psig instrument channels

Reactor Building Spray Pumps
reactor building 30 psig instrument channels

Reactor Building Spray Valves
reactor building 30 psig instrument channels.

This table also references TS Table 3.5.1-1 Note 6 which currently allows the minimum number of operable channels to be reduced to two, provided that the system is reduced to one-out-of-two configuration. In the event that these channels cannot be placed in a one-out-of-two configuration Note 6 requires

the operator to apply TS 3.3. TS 3.3 defines the conditions necessary to assure immediate availability of the emergency core cooling system and does not have applicability in an RPS bypass situation.

The licensee has proposed changes to TS 3.5.1-1 Note 6 that would direct the operator to apply the actions specified by TS Table 3.5.1-1 Column 5 if these channels cannot be placed in a one-out-of-two configuration. TS Table 3.5.1-1 Column 5 refers to TS Table 3.5.1-1 Notes 1 and 5. Note 1 requires the reactor to be in hot shutdown within 12 hours if the minimum number of operable channels or the minimum degree of redundancy are not met. Note 5 requires that if the minimum number of operable channels or the minimum degree of redundancy cannot be met within an additional 48 hours, the reactor be placed in cold shutdown within 24 hours. This change would remove a misleading reference to place the plant in a mode where the affected instrumentation system is not required.

The licensee also proposed changes to the Bases for TS 3.5.1-1 regarding the EFIC system to discuss operation of the EFIC system maintenance bypass when one RPS channel contains an inoperable function in the untripped state. An EFIC channel may be placed in maintenance bypass by use of a bypass key switch, but only one channel may be placed in maintenance bypass at a time. Currently when an RPS channel is placed in bypass only the associated EFIC channel may also be placed in maintenance bypass. If a failure occurred in an RPS function that is not an input to the EFIC, only the associated EFIC channel would be allowed to be placed in maintenance bypass. The licensee's proposed changes would allow, based on plant conditions and management approval, for any of the EFIC channels to be placed in maintenance bypass when an RPS function is in bypass, but is not an input to the EFIC system.

Based on the above evaluation, the staff concludes that the proposed changes to the TSs of ANO-1 are acceptable because they are in accordance with Supplement 2 of BWOG Topical Report BAW-10167-A, "Justification for Increasing the Reactor Trip System On-Line Test Interval-Additional Information on Allowed Outage Time," which was previously accepted by the staff.

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 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 (59 FR 10005). 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.

Principal Contributor: B. Marcus

Date: **October 24, 1994**