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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 186 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 October 7, 1996, and as supplemented February 10, and May 8, 1997, Entergy Operations, Inc. (the licensee) submitted a request for changes to the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TS). The requested changes would revise the channel functional testing frequency for most of the Reactor Protection System (RPS) and Engineered Safety Feature Actuation System (ESFAS) instrumentation from monthly sequential testing to triannual (once every 123 days) staggered testing. The amendment would also allow the use of cycle independent shape annealing matrix (CISAM) elements to be used in the Core Protection Calculators (CPC). Presently, cycle-specific SAM elements are determined during startup testing after each core reload. Use of CISAM elements would eliminate several hours of critical path work after a refueling outage. The amendment would further make some administrative changes to the TS for clarification and editorial purposes.

In the licensee's October 7, 1996, letter, reference was made to a Combustion Engineering (CE) topical report that had not yet been submitted to the Nuclear Regulatory Commission (NRC). The report was referenced in support of modification of the RPS and ESFAS surveillance frequencies. As a result, the licensee, in a letter to the staff dated February 10, 1997, withdrew all references to the topical report and its 120-day frequency and submitted plant-specific information in an attachment to the February 10, 1997, letter. In a letter dated May 8, 1997, the licensee resubmitted TS page B 3/4 3-1 to remove any reference to the CE report. The information in the February 10, and May 8, 1997, submittals only clarified the original submittal and did not expand the scope of the original no significant hazards determination published in the Federal Register on January 29, 1997 (62 FR 4346).

2.0 EVALUATION

The following changes to TS Table 4.3-1 and 4.3-2 are proposed:

1. The monthly (M) channel functional testing requirement in Table 4.3-1 would be changed to triannual (TA) for all functional units except for the reactor trip breakers. The TA testing requirement is modified by

Note 10 requiring the channel functional testing to be performed on a staggered test basis. The TS Bases for this TS would also be modified to incorporate these changes.

2. The weekly core protection calculator (CPC) addressable constant channel check requirement in Table 4.3-1 would be removed. Note 9 would be modified to require the addressable constant verification to be performed as part of the channel functional test.

3. Note 5 to Table 4.3-1 would be modified to allow a "verification" of the shape annealing matrix (SAM) elements used in the CPCs. This change would allow the use of CISAM elements in the CPCs.

4. The channel functional testing requirements in Table 4.3-2 would be changed from monthly to triannual. The TA testing requirement would be modified by Note 2 requiring the channel functional testing to be performed on a staggered test basis. The Note 1 requirement to manually test the actuation logic for the functional units would also be changed from 31 to 123 days to reflect the TA frequency. The Bases for this TS would also be modified to incorporate these changes.

2.1 Change in RPS and ESFAS Surveillance Frequencies

The proposed change to increase the RPS and ESFAS surveillance frequencies from monthly to triannual is based on topical reports CEN-327-A, "RPS/ESFAS Extended Test Interval Evaluation," Supplement 1 to CEN-327-A, and the supplemental information provided by the licensee in its February 10, 1997, submittal. Both CEN-327-A and CEN-327-A, Supplement 1, were prepared by Combustion Engineering for the Combustion Engineering Owners Group (CEOG). The purpose of these reports was to evaluate the safety impact and provide justification for extending the current monthly surveillance test interval for both RPS and ESFAS instrumentation. Both reports used probability risk analysis techniques to demonstrate that the proposed surveillance interval extensions do not result in increased plant risk when compared with current TS requirements.

The NRC's evaluation and acceptance of these topical reports were documented by a safety evaluation report (SER) that was sent to the chairman of the CEOG on November 6, 1989. The NRC found that the referenced topical reports provide an acceptable generic basis to support plant specific TS changes for extending both RPS and ESFAS channel functional test intervals from monthly to quarterly. The licensee is proposing, however, to extend the surveillance interval from monthly to triannual. Triannual has been defined by the licensee as "at least once per 123 days." The 123 days comes from adding up the total number of days from the longest four sequential calendar months.

The CE analysis estimated a slight increase in RPS unavailability as a result of extending the surveillance test interval. The analysis also estimated a reduced core melt frequency based on a reduction in surveillance test induced transients. The overall effect of the proposed change on safety was

determined to be negligible. The result of the reduced ESFAS testing on core melt frequency was found to be similar to that for RPS.

The ANO-2 TS Section 3/4.3.1 provides instrumentation operability and surveillance requirements for the RPS. TS Table 4.3-1 specifies the modes and frequency for the performance of channel checks, channel functional tests and channel calibration for each RPS channel. TS Table 4.3-2 specifies the functional test surveillance requirements for the ESFAS.

The staff SER for CEN-327 concluded that the CE report did not address the effects of drift in both the sensors or instrument strings. The effects of drift are plant specific and; therefore, should be included with each individual plant analysis. The licensee stated that, for ANO-2, CE performed the required setpoint drift analysis assuming a triannual surveillance frequency. The licensee reviewed and approved the CE analysis. ANO calculation 92-E-0084-01, "Plant Protection System Bistable Drift Analysis," dated June 1993, evaluated the effect on instrument uncertainties of extending the RPS and ESFAS functional surveillance test frequencies from monthly to triannual. The licensee's analysis determined that the only components requiring analysis were the RPS and ESFAS bistables and the variable setpoint cards. The licensee stated that the results of the analysis demonstrated that the observed changes in instrument uncertainties for the extended surveillance test frequencies do not exceed the current monthly setpoint assumptions. The licensee has reviewed the instrument uncertainty information for each channel involved and has determined that the drift occurring in that channel over the proposed 4-month period would not cause the setpoint value to exceed the allowable value.

The staff confirmed that the licensee's evaluation for the proposed surveillance extension was derived from the RPS and ESFAS fault tree models developed for and presented in topical report CEN-327-A, CEN-327-A, Supplement 1, and the licensee's own analysis provided in its February 10, 1997, submittal. Therefore, the staff found the licensee's proposed surveillance frequency extension for the RPS and ESFAS from monthly to triannual acceptable. The licensee, however, should maintain onsite records of the setpoint calculations and associated data to support planned future staff audits.

2.2 Use of CISAM

The Core Protection Calculators (CPCs) rely upon the excore detector signals to trip the reactor in the event of an anticipated operational occurrence (AOO) to ensure that the specified acceptable fuel design limits on minimum departure from nucleate boiling ratio (DNBR) and peak linear heat rate are not violated. To do this, each CPC channel synthesizes the core average axial power shape from three levels of excore detector signals. The relative excore detector readings are subsequently adjusted within the CPCs by a set of channel dependent shape annealing constants. These SAM constants are typically measured during the reload startup power ascension and installed into the CPC channels. Incore and excore signal data are taken at regular intervals during the initial startup power ascension and the incore data is

subsequently processed through a computer code to determine the relative power at the core periphery. An automated data reduction code is then used to verify the data, calculate the SAM constants, and determine whether the measured SAM meets a set of review and acceptance criteria to justify its implementation into the CPC channels.

The licensee has proposed to change Note 5 of Table 4.3-1 in TS 3/4.3.1 to allow either a determination of a cycle-dependent SAM or verification of the acceptability of a CISAM to be used in the CPCs. The cycle-specific SAMs from previous cycles have been found not to be reload dependent and, in fact, would have been acceptable for other cycles, even other units. In addition, since the cycle-specific SAM is only measured once during reload startup, the representation has been observed to be less accurate as the cycle progresses and the power shape evolves from a flattened cosine to a saddle shape. The CISAM would be based on middle-of-cycle data and; therefore, would be more representative of the entire cycle. If the CISAM is used, the matrix elements will be validated each cycle during startup testing and must meet the same acceptance criteria as the cycle-specific SAM elements. This ensures that the axial power shapes generated by the CPCs will trip the reactor so that minimum DNBR and peak linear heat rate are not violated in the event of an AOO. If these criteria are not met, the licensee would calculate a cycle-specific SAM to be used in the CPCs.

The licensee has stated that the CISAM elements will be validated during startup testing by monitoring the same parameters used for the cycle-specific SAM elements. The cycle-specific acceptance criteria will be expanded to include additional CISAM acceptance criteria. If the CISAM is determined to be no longer valid, a cycle-specific SAM will be calculated and used in the CPCs until conditions allow for the measurements or reanalysis of the CISAM. The CISAM performance will be monitored throughout the cycle on a frequency of approximately every 90 effective full power days (EFPD).

Based on the above review, the staff finds the proposed TS change to provide the option of using CISAM elements in the CPCs acceptable.

2.3 Administrative Changes

The following administrative changes to the TS are proposed:

1. TS Table 1.2 is being modified by adding a new surveillance frequency notation of triannual (TA) with a frequency of "At least once per 123 days." The triannual term is derived from the frequency of every 4 months or three times a year. The change to this table is needed to support the frequency changes associated with TS 3/4.3.1 and 3/4.3.2.

2. Action 2 on TS Table 3.3-1 and Action 10 on TS Table 3.3-3 are being modified to reference the Quality Assurance (QA) Manual Operations. Specification 6.5.1.7.n was removed from the TS by Amendment 160, which relocated this requirement to the QA Manual Operations.

3. Minor formatting changes are being made to TS Table 4.3-1 to make the data in the Channel Functional tests column more closely match the Channel Calibration column by placing one requirement per line for human factors considerations.

4. The proposed changes to TS Table 3.3-3, functional unit 6.a, are being made to more accurately reflect the design of the Recirculation Actuation System (RAS). The changes listed below for this table are not due to a change in the plant design or operation, but simply a correction to the table. The RAS does not have remote manual trip buttons like all the other functional units on this table. This difference is described in Note (c) for functional unit 6.a. As stated in the note, the manual trip buttons for RAS are located in the Auxiliary Relay Cabinets (ARCs). There are two ARCs, with a set of 2 manual trip buttons per ARC, for a total of four manual trip buttons for RAS. The simultaneous operation of both buttons on an ARC will result in the actuation of a single train of RAS. The operation of all four manual trip buttons in the ARCs is required to initiate a full RAS actuation. The following changes are being made to functional unit 6.a:

   a. In the Total No. of Channels column, for all the other manual trip functional units on this table, the number of channels listed is the total number of manual trip buttons that are installed. For RAS, the "2 sets of 2" is accurate because there is a set of two buttons installed in each of the two ARCs for a total of four buttons.

   b. In the Channels To Trip column, for all the previous manual trip functional units on this table, the number of channels listed in this column is the number of buttons required to be operated to initiate a full actuation of the functional unit. For RAS, the simultaneous operation of both buttons on an ARC will result in the actuation of a single train of RAS, but a full actuation will not occur until all four buttons on the ARCs are actuated. Therefore, for a full RAS actuation, it requires operation of "2 sets of 2" manual trip buttons.

   c. In the Minimum Channels Operable column, for all the previous manual trip functional units on this table, the number of channels listed in this column is the total number of buttons installed. The total number of RAS buttons installed is "2 sets of 2" or four buttons.

5. The proposed changes to TS Table 3.3-3, functional unit 8.a, are being proposed to correct the designation of manual trip buttons to manual trip switches and to consistently reflect the number of switches required to be operated to get a full actuation. These changes are not due to a modification to the plant design or operation, but simply corrections to this table to make it reflect the as-built configuration of this system. The Emergency Feedwater Actuation System (EFAS) has four remote manual trip switches per steam generator (SG). All four switches are required to be operated to manually initiate a full EFAS actuation for that SG. In the Channels To Trip column, for all the functional units (including

RAS with the proposed change described above), the number of channels listed in the column are the number of buttons or switches required to get a full actuation of the function. The number of trip switches that are required to be operated to get a full actuation on EFAS is "2 sets of 2 per SG."

6. Note (a) is being added to TS Table 4.3-2 functional unit 6.a to indicate the manual trip buttons are the local buttons on the ARCs. This note was copied from TS Table 3.3-2 Note (c) for consistency. Functional unit 8.a is also being modified to correct the designation of manual trip "buttons" to manual trip "switches."

The staff has reviewed the above changes and has determined they are administrative in nature and only serve to clarify the existing TS or correct previous errors. Therefore, the above administrative changes are acceptable.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arkansas State official was notified of the proposed issuance of the amendment. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a surveillance requirement. 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 (62 FR 4346). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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