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

December 19, 1990

Docket No. 50-313

Mr. Neil S. Carns
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Russellville, Arkansas 72801

Dear Mr. Carns:

SUBJECT: SAFETY AND PERFORMANCE IMPROVEMENT PROGRAM (SPIP) IMPLEMENTATION AUDIT AT ARKANSAS NUCLEAR ONE, UNIT 1 (ANO-1) (TAC NO. 68199)

Enclosed is an evaluation report on the implementation of the Babcock & Wilcox Owner's Group's (BWOG) Safety and Performance Improvement Program (SPIP) at ANO-1. This evaluation is based on an NRC staff audit at the ANO site during the week of August 27 to 30, 1990.

The audit of SPIP implementation was conducted in two phases: (1) a programmatic audit to evaluate the commitment and involvement of corporate management and the site organization in the SPIP, and the process for disposition of SPIP technical recommendations (TRs), and (2) an implementation audit to perform more detailed review of the implementation and disposition of individual SPIP TRs. The programmatic audit was completed in September 1989, and the results were transmitted to you in a letter dated January 16, 1990. This implementation audit completes Phase 2 of the SPIP audit.

During the implementation audit, the NRC staff reviewed the implementation and disposition of 21 TRs. Based on the review of these TRs, the staff found that in most cases the TRs reviewed had been satisfactorily implemented or were in the process of being satisfactorily implemented, had satisfactory hardware and/or software changes that met the intent of the TRs, had acceptable analysis that verified the existing plant procedures or design met TR intent, had acceptable justification basis for rejection, and had acceptable analysis to support non-applicability. In addition, the staff also found that good communication channels existed between Entergy Operations, Inc. and ANO-1 personnel. The staff also found that the weaknesses identified during the programmatic audit had been strengthened. Therefore, the staff concluded that Entergy Operations, Inc. had established a SPIP program at ANO-1 that satisfactorily controlled the disposition and the implementation of the majority of

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the BWOG SPIP TRs. However, the staff also identified minor weaknesses in the implementation proceedings associated with a few TRs (TRs 125, 066, and 179) which are discussed in the enclosed safety evaluation report.

This completes our efforts on TAC 68199.

Sincerely,

Thomas W. Alexion

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Enclosure:
As stated

cc w/enclosure:
See next page

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SAFETY AND PERFORMANCE IMPROVEMENT PROGRAM IMPLEMENTATION AUDIT

ARKANSAS POWER AND LIGHT COMPANY

ARKANSAS NUCLEAR ONE, UNIT 1

DOCKET NO. 50-313

1.0 SAFETY AND PERFORMANCE IMPROVEMENT PROGRAM AUDIT

1.1 Introduction

From August 27 to 30, 1990, the Nuclear Regulatory Commission (NRC) staff conducted an implementation audit of the Safety and Performance Improvement Program (SPIP) at Entergy Operations Incorporated Arkansas Nuclear One, Unit 1 (ANO-1) site Russellville, Arkansas. The SPIP program was developed by the Babcock and Wilcox Owners Group (BWOG) in order to reduce both the number of reactor trips and the complexity of post-trip response. The purpose of this audit was to evaluate the BWOG SPIP technical recommendation implementation at ANO-1.

1.2 Background

After the accident at Three Mile Island, Unit 2 (TMI-2), nuclear power plant owners made a number of improvements to their facilities. Despite these improvements, the U.S. Nuclear Regulatory Commission (NRC) staff was concerned that the number and complexity of events at Babock and Wilcox (B&W) nuclear plants had not decreased as expected. This concern was reinforced by the total-loss-of-feedwater event at Davis-Besse Nuclear Power Station on June 9, 1985, and the overcooling transient at Rancho Seco Nuclear Generating Station on December 26, 1985.

By letter dated January 24, 1986, the NRC Executive Director for Operations (EDO) informed the Chairman of the BWOG that a number of recent events at B&W-designed reactors should be reexamined. In its February 13, 1986 response to the EDO's letter, the BWOG committed to lead an effort to define concerns relative to reducing the frequency of reactor trips and the complexity of post trip response in B&W plants. The BWOG submitted a description of the B&W program entitled "Safety and Performance Improvement Program" (BAW-1919) to the NRC staff on May 15, 1986. Five revisions to BAW-1919 have also been submitted. Included in BAW-1919 were specific tasks identified at Technical Recommendations (TRs) to be completed by each utility under a SPIP program.

The NRC staff reviewed BAW-1919 and its five revisions and presented its evaluation in NUREG-1231, dated November 1987, and in Supplement No. 1 to NUREG-1231 dated March 1988. The NRC staff has previously performed an audit of the BWOG's disposition of TRs that were developed by various BWOG committees and task groups. The results of that audit, which were favorable, were reported in NRC Inspection Report 99900400/87/01. However, the staff determined that an

NRC audit program to ensure the quality of each utility's program used to control the disposition and implementation of TRs is necessary since the brevity of the recommendations developed by the BWOG did not provide specific design details.

Initially, a programmatic audit was conducted that evaluated the adequacy of the SPIP programmatic process and TR disposition. This was followed by an implementation audit that evaluated the adequacy of TR implementation.

1.3 BWOG Recommendation Categories

All BWOG recommendations are to be tracked through closure. The following categories have been selected as "bins" to be used by the utility when assigning tracking status. These categories, as well as explanatory notes, are addressed in the BWOG Recommendation Tracking System (RTS), in BAW-1919, and in NUREG-1231.

Evaluating for Applicability (E/A)

The recommendation is being evaluated by the utility for applicability to their particular plant. The evaluation may conclude that the recommendation is (a) not applicable, (b) was implemented previously and is operable, or (c) if applicable, requires further evaluation to determine if it should be implemented.

Evaluating for Implementation (E/I)

An evaluation of the recommendation for applicability has been completed, and the recommendation is now being evaluated to determine if it should be implemented.

Implementing (I)

Utility evaluation is complete and the need for software/hardware changes to meet the intent of the recommendations have been identified.

Software changes have been assigned to the appropriate organization and are scheduled and budgeted. Hardware changes have been assigned to the appropriate organization for implementation, funding is approved, and the changes are included in a corporate plan for implementation.

Additional comments on implementation status or method of implementation are appropriate.

Closed/Operable (C/O)

Utility meets the intent of the recommendation, and implementation is complete.

Review of existing plant software or hardware results in a conclusion that intent of recommendation is already met. If software changes were required,

new/revised training procedures, training plans, etc. are approved and issued. Personnel are trained and procedures issued.

Closed/Not Applicable (C/NA)

Utility evaluation determines that the recommendation does not apply to plant-specific configuration; no past experience of underlying problems has occurred.

Software/Hardware of concern does not exist, and existing software/hardware is such that a similar problem could not develop at their plant.

Additional comments on why it is not applicable are required.

Closed/Rejected (C/R)

Utility evaluation determines software/hardware changes meeting the intent of the recommendation are unacceptable and will not be implemented.

Recommendations may be unacceptable because:

(1) Implementation would not result in an overall improvement in plant safety or performance.

(2) Implementation of recommendation as described would not effectively resolve problem of concern.

(3) Resources required for implementation are excessive for expected plant improvement or benefit.

Additional comments on why it is rejected are required.

1.4 Programmatic Audit - Scope and Summary

The NRC staff had performed the SPIP programmatic audits at five utilities having the B&W-designed reactors. The Programmatic Audit included an evaluation of (1) the process used to control BWOG SPIP TR disposition, (2) the adequacy of TR file documentation, (3) corporate and site organizational involvement in the SPIP process, (4) the disposition of approximately 34 selected TRs, and (5) the disposition and implementation status of the approximately 222 BWOG SPIP TRs.

As a result of the programmatic audit at ANO-1 in September 1989, the NRC staff found that (1) Entergy Operations, Inc. and ANO-1 had established a formal process that adequately controlled the disposition of TRs from identification on the BWOG RTS through final disposition with three exceptions: the procedures had not required written justification for evaluation or implementation schedule slippage, had not included provisions for reprioritization of TRs that had schedular slippage, and had not required a final implementation due date, (2) the documentation presented in the TR files was complete, auditable, and adequately supported decisions regarding TR disposition, (3) corporate and site organizations were adequately involved in the SPIP process with the exception that management may not be placing enough emphasis on timely completion of TRs that had schedule slippage, (4) the disposition of selected TRs was acceptable,

and (5) the SPIP TRs were being implemented in a timely manner. Details of the SPIP programmatic audit of ANO-1 are contained in the ANO-1 audit report "Programmatic Audit of the Safety and Performance Improvement Program at the Arkansas Nuclear One, Unit 1" dated January 16, 1990.

1.5 Implementation Audit - Scope

The SPIP implementation audit included an evaluation of selected TR files to determine if (1) the plant modifications implemented met the intent of the TR, (2) the operating, training and/or maintenance procedures implemented met the intent of the TR, (3) the engineering analysis used to verify that the existing plant design and/or existing procedures met the intent of the TR was adequate, (4) the basis to reject a TR was adequate and (5) the communication channels and interfaces between the corporate and site management, operations, training, and maintenance organizations were adequate. The results of the implementation audit are documented in Section 3.2 of this report.

2.0 ENTERGY OPERATIONS, INC. AND ANO-1 TR IMPLEMENTATION

The Entergy Operations, Inc. and ANO-1 TR disposition and implementation processes are controlled and administered through Nuclear Program NP-40, "Transient Reduction Program" (TRP). The TRP was developed to provide a coordinated method of processing and tracking TRP recommendations. The SPIP TR's are included in the TRP.

3.0 REVIEW OF SELECTED RECOMMENDATIONS

3.1 Selection Criteria

The staff reviewed 21 TR files and associated documentation and evaluated the timeliness and acceptability of TR implementation. These TRs were selected based on NUREG-1231, "Safety Evaluation Report Related to Babcock and Wilcox Owners Group Plant Reassessment Program," the most recent Recommendation Tracking System (RTS) report, and the "Programmatic Audit Report - Safety and Performance Improvement Program at Arkansas Nuclear One, Unit 1." A broad selection of TRs were selected so that representative samples from the following categories were reviewed: (1) TRs that required further attention based on the concerns identified during the programmatic audit, (2) TRs designated "key" by the BWOG and TRs designated high priority by the NRC staff, (3) TRs that required a plant software change for closure, (4) TRs that required a plant hardware change for closure, (5) TRs of major importance based on individual plant operating experience, and (6) TRs that were rejected by the individual utilities. A listing of TRs reviewed and TR status at the conclusion of the SPIP Implementation Audit is contained in Appendix A.

3.2 Results of Staff Review

During the course of the SPIP implementation audit, the staff reviewed the TR files, plant drawings, plant modification packages, training documents, operating procedures, and maintenance procedures associated with the selected TRs. In addition, the staff conducted interviews with Entergy Operations, Inc. and ANO-1 personnel to obtain supplemental information and resolve concerns found during the audit. The staff also performed in-plant-walk-downs to verify

the accuracy of the information provided during the above paperwork reviews and interviews.

The staff found evidence that in most cases the TRs reviewed had been satisfactorily implemented or were in the process of being satisfactorily implemented, had acceptable analysis that verified existing plant procedures or design met TR intent, had acceptable justification basis for rejection, and had acceptable analysis to support non-applicability. The staff also found that good communication channels existed between Entergy Operations, Inc. and ANO-1 personnel and that the TRs were being implemented in a timely manner.

The staff also found that in most cases Entergy Operations, Inc. and ANO-1 had strengthened the weak areas identified during the programmatic audit.

A brief discussion of the TR documentation reviewed as well as any exceptions to the above are discussed below.

TR-117-PES, Categorized C/O

This TR recommended that the utility modify inverter overcurrent protection to ensure that the breakers/fuses open on overcurrent before the inverters fail. This recommendation was based on the inverter configuration at Rancho Seco. That is, if an electrical fault occurred on a circuit powered by an inverter, the inverter could fail before the fuse or circuit breaker protecting that circuit opened. In addition, an automatic transfer to another inverter would the take place and the existing fault would in turn fail that inverter.

The inverter configuration at ANO-1 will not allow a cascading failure to occur. A fault on one inverter will be isolated with that inverter as the ANO-1 design maintains an available alternate power source. In the event of a fault where an inverter fails and cannot produce enough current to trip its own breaker/fuse, an inverter status switch will switch to the alternate power source which is capable of supplying enough current to trip the affected inverters breaker/fuse. The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-117-PES had been satisfactorily implemented.

TR-190-ICS, Categorized C/O

This TR recommended that each utility develop backup manual or automatic controls for pressurizer level control and pressurizer pressure control powered from a power source other than non-nuclear instrumentation (NNI). Manual operator control of pressurizer pressure and pressurizer level at ANO-1 are available upon loss of NNIX DC power. Even though the Automatic/Manual controllers are unavailable, there are individual hand switch controls which are used to maintain pressure and level control independent of NNIX power. The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-190-ICS had been satisfactorily implemented.

TR-038-ICS, Categorized I

This TR recommended that each utility develop and implement a recommended preventive maintenance program for the integrated control system/non-nuclear

instrumentation (ICS/NNI). Documentation in the file stated that the majority of the procedures necessary to implement this recommendation have been completed. The only exceptions were those items scheduled for completion during the IR9 refueling outage. The Transient Reduction Meeting Committee deferred closeout until that time. A new due date of January 30, 1991 was established for some of the ICS and the NNI preventive maintenance procedures that cannot be developed until work being performed during IR9 is completed. The staff held discussions with Entergy Operations, Inc. personnel, reviewed the above TR package and associated information, found it acceptable, and therefore, concluded that TR-038-ICS had been satisfactorily implemented to date.

TR-107-ICS, Categorized C/O

This TR recommended that ICS system and/or subsystem tuning be performed in accordance with vendor recommendations or at least every other refueling outage and that improved ICS maintenance and tuning methods to correct post-trip MFW system control problems be developed and incorporated into a periodic surveillance/tuning program.

The first tuning of the ICS since initial startup was performed following the IR7 refueling outage after the installation of Lovejoy MFW pump controls. The consistent and reliable performance of the ICS at ANO-1 questions the need to tune the system every other refueling outage. However, Entergy Operations Inc. recognizes the importance of monitoring ICS performance and retuning this system as necessary. Consequently, Entergy Operations, Inc. and ANO-1 investigated methods for improving ICS maintenance and tuning and opted to install a sophisticated ICS monitoring system during IR8 (see closeout of TR-208-ICS and DCP 87-1070). This system allows ANO-1 to monitor the performance of the ICS on demand, including post-trip data, and to schedule retuning based on need. Therefore, retuning may be less or more frequent than every other refueling outage. Development of a periodic surveillance/tuning program will center around the use of this ICS monitoring tool.

The second part of this recommendation cited events which occurred at ANO-1 on January 7, 1980, December 8, 1980, April 8, 1981, and September, 26 1982, all of which involved post-trip MFW control problems. Each of these events was reviewed and the control problems were found to be corrected following the installation of emergency feedwater initiation and control (EFIC) system, the installation of Lovejoy controls for the main feedwater (MFW) pumps, and the elimination of the preferred MFW pump trip.

During discussions with Entergy Operations, Inc. and ANO-1 personnel the staff determined that ANO-1 did not have a formal ICS tuning procedure but relied instead on past ICS tuning "work plans" and B&W personnel input. Also, a formal periodic surveillance/tuning program (as recommended by the BWOG) has not been developed.

As stated above, Entergy Operations, Inc. resolution of TR-107 questions the need to tune the ICS every other refueling outage. During discussions, Entergy Operations Inc. and ANO-1 personnel stated that ICS tuning will primarily be based on design changes, plant performance, and the newly installed ICS data acquisition and monitoring systems.

The staff reviewed the above information and found that even though ANO-1 did not have a formal tuning procedure as such, work plans had been developed to tune the ICS in the past. These tuning work plans will be reinstituted to tune the ICS when needed. In addition, with ANO-1's ability to monitor the ICS on demand with the Plant Performance and Analysis System (PPAS) and in conjunction with plant personnel awareness and training, the staff concluded that the information provided was acceptable, and therefore, concluded that TR-107-ICS had been satisfactorily implemented.

TR-001-ICS, Categorized C/O

This TR recommended that the reactor coolant (RC) flow inputs to the ICS be deleted and replaced with equivalent signals based on RC pump status in accordance with either of the two conceptual designs presented in the source document, and concurrent with the replacement of the RC flow signals that the existing Unit Load Demand (ULD) limit based on RC flow be deleted.

ANO-1 had replaced the 4 RC flow inputs with RC pump status. However, if one RC pump trips during normal operation, the system reverts back to monitoring the RC flow input. Furthermore, during the IR9 refueling outage a modification will be installed to auctioneer the RC flow inputs so faulty signals will not cause a RX trip thereby greatly increasing system reliability. In addition, ANO-1 had deleted the ULD limit based on RC flow as recommended by the TR.

The staff reviewed the above information and held discussions with ANO-1 and Entergy Operations, Inc. personnel, found all acceptable, and therefore, concluded that TR-001-ICS had been satisfactorily implemented.

TR-104-ICS, Categorized I

This TR recommended that each utility incorporate automatic selection of the input signals to the ICS/NNI such that a single failure would not cause a plant trip. The licensee was implementing Design Control Package (DCP) No. 87-1041, "ICS Input Auctioneering," dated June 1990, which requires the installation of a Smart Automatic Signal Selector (SASS) during the IR9 refueling outage scheduled for October 1990. The SASS will select a good signal from either NNI-X or NNI-Y with NNI-X signals being preferred. The licensee applied a set of four criteria to the ICS input signals for selection as an input to the SASS. The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-104-ICS had been satisfactorily implemented to date.

TR-119-PES, Categorized I

This TR recommended that each utility incorporate cleaning and inspection activities into the electrical bus maintenance procedures. The procedures should require the removal of dirt and dust from the buses and the tightening of connections. The licensee had incorporated cleaning and inspection activities into preventive maintenance (PM) procedures for AC and DC motor control centers, metal clad switchgear, and the 480V load center switchgear. The scheduling and performance of these procedures is tracked by the SIMMS computer. In addition to these PM procedures, the licensee had developed a Thermographic Analysis Program for bus inspection that will be incorporated

into the PM procedures with an 18 month inspection interval. The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-119-PES had been satisfactorily implemented to date.

TR-125-IAS, Categorized I

This TR recommended that each utility give critical air-operated valves a periodic operability test and that the in-service in-place stroke times be compared with the design basis stroke times, and that the valves be rebuilt as necessary to recover their stroking times. This file contained an outdated and incorrect list of valves. The list attempted to delineate those valves for which the licensee did not have a design basis stroke time. The licensee eventually produced an updated list of the valves that did not have an associated design basis stroke time. However, the licensee did not have a complete list of critical valves nor was the criteria established by which the licensee could determine which air-operated valves were critical and therefore should be addressed under TR-125. In addition, the TR file did not contain the criteria for establishing the allowable limits for deviations between the design basis stroke time and the in-service stroke time. The licensee stated that once the design basis stroke time had been determined, the in-service stroke time would be measured as part of the PM program. The licensee had not yet scheduled the in-service stroke time measurements for these critical valves and proposed the 10th refueling outage currently scheduled in the Spring of 1992 as a possibility. The staff reviewed the above information and the basis for the implementation status, and concluded that TR-125-IAS was not being satisfactorily implemented.

TR-159-OPS, Categorized C/O

This TR recommended that each utility evaluate the secondary system controls and make the necessary plant modifications to achieve remote manual control in the main control of all post-trip steam flow paths and all pumps and valves for both MFW and emergency feedwater (EFW) systems. Also, this evaluation should ensure that sufficient redundant capability exists in order to provide a high degree of reliability for isolating a failed path in order to terminate excessive steam or feed flow. The licensee reviewed all of the secondary system remote manual controls and determined that remote manual control of all post-trip steam paths existed, that MFW and EFW pumps and valves had remote manual controls, and that a failed steam or feed path could be isolated from the main control room. The remote manual controls also included valve position indication. These controls and indications were observed during the plant walkdown. The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-159-OPS had been satisfactorily implemented.

TR-181-OPS, Categorized C/O

This TR recommended that each utility verify the adequacy of the instrumentation and displays used to assess the Abnormal Transient Operating Guideline (ATOG) stability parameters. The verification process should include either a simulation or walk-through of the following generic Category "C" events: (1) Loss of Offsite Power, (2) Loss of ICS/NNI power, (3) Small steam leak, turbine bypass valves (TBV) or main steam safety valves (MSSV), (4) Loss of MFW and EFW, and (5) excessive EFW. The B&W ATOG was reviewed and the stability

parameters listed. The licensee stated that the stability parameters were displayed on the Safety Parameter Display System (SPDS) both as a function of their real time value and as part of the Pressure-Temperature (P-T) curve. These parameters were included as part of the Regulatory Guide (RG) 1.97 safety related instrumentation. The SPDS and the RG 1.97 displays were observed during the plant walkdown. The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-181-OPS had been satisfactorily implemented.

TR-041-MOV, Categorized C/O

This TR recommended that each utility develop a procedure to confirm by field inspection all design data required to size the operators and valves for all safety-related motor-operated valves (MOV). Prior to this TR, the licensee had began a similar effort in response to NRC Bulletin 85-03 and NRC Information Notice 86-03. Through a special work plan, as-built design information was documented for each safety-related MOV. Stress calculations were performed and in some cases modifications were implemented for valves determined to have either an undersized or oversized operator. MOV diagnostic testing was then performed as the final proof test of the valve's capability to perform its design function. Three valves remain to be tested during the IR9 refueling outage scheduled for October, 1990. Subsequent to the closeout of this TR, Generic Letter (GL) 89-10 was issued which effectively superseded and upgraded the scope of the BWOG recommendation. The licensee's response to GL 89-10 will be monitored by future NRC inspection activity. The staff reviewed the above information including a sample of the field work plans, found all acceptable, and therefore, concluded that TR-041-MOV had been satisfactorily implemented to date and justifiably closed. However, since the staff is currently reviewing the licensee's response to GL 89-10, further actions may be required per the resolution of GL 89-10.

TR-045-MOV, Categorized C/O

This TR recommended that each utility review existing maintenance procedures for all motor-operated safety-related valves to determine whether revisions are needed to provide proper instructions for setting torque switches and bypass limit switches. The licensee stated that: (1) the existing 1403 series electrical maintenance procedures provide adequate guidance for torque and limit switch setup, (2) the procedures are reviewed every two years to verify continued applicability, (3) the switch setting methods provided in the procedures have been in use for an extended period of time with no deficiencies encountered, and (4) switch setting and adjustment is performed by technicians who have been certified in the MOV program. The staff reviewed the above procedures, held discussions with the licensee, found all acceptable, and therefore, concluded that TR-045-MOV had been satisfactorily implemented.

TR-099-OPS, Categorized C/O

This TR recommended that each utility ensure that plant operating procedures reflect guidance provided in Chapter IV of the Abnormal Transient Operating Guideline (ATOG) Technical Basis Document regarding excessive main feedwater (MFW), throttling auxiliary feedwater (AFW), and throttling high pressure injection (HPI). The guidance was provided as a means to reduce the magnitude

of a plant transient following a reactor trip or accident by balancing decay heat generation with heat transfer in the steam generator, while maintaining reactor plant pressure and pressurizer level within acceptable limits. The licensee's procedure review revealed that the existing procedures adequately implemented the ATOG guidance. The staff review identified one apparent procedural deviation from the ATOG guidance. Recommendation Subpart 2.A.4.1 stated that "HPI flow should be throttled to keep the pressurizer level near the normal operating level setpoint when the SCM (subcooling margin) exists." The plant emergency operating procedure (EOP) 1202.01, Revision 8, which was in effect at the time of the TR closeout, instructed the operator to terminate HPI at a pressurizer level of 40 inches and increasing, if SCM exists. The 40 inch level is well below normal operating level in the pressurizer. However, later revisions to EOP 1202.01 (currently Revision 20) have eliminated the level-dependent termination of HPI and now instruct the operator to throttle HPI to maintain an acceptable combination of temperature and pressure as defined on an attached figure. The staff concluded that the current HPI throttling guidance meets the intent of the ATOG guidance. The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-099-OPS had been satisfactorily implemented.

TR-096-MSS, Categorized C/O

This TR recommended that each utility evaluate the design of the turbine bypass valve (TBV) and atmospheric dump valve (ADV) systems to ensure that (1) the TBV and ADV failure mode prevents excessive steam flow on loss of the ICS/NNI power supplies, (2) the TBVs and ADVs are controllable from the control room on loss of ICS/NNI power to ensure decay heat removal capabilities, (3) a stuck-open TBV and/or ADV can be isolated from the control room, and (4) the ADVs can be operated from the control room following a loss of offsite power. The licensee concluded that their existing design met all of the recommendations with the exception that the ADVs could not be controlled from the control room on loss of ICS power, in which case they fail in the closed position. The licensee determined that this variance with the TR was acceptable in that the redundancy and capacity of the ADVs and the main steam safety valves (as a backup) ensure sufficient control of decay heat in the event of loss of ICS power. Each of the two ADVs have a 3.5 percent reactor power equivalent capacity, which is the approximate decay heat generation one minute after a reactor trip with a design-case power history. The staff concurred that the ADVs provide a reliable means of decay heat removal in the event of a loss of ICS power. The staff reviewed the above information and the remainder of the licensee's design review, found it acceptable, and therefore, concluded that TR-096-MSS had been satisfactorily implemented.

TR-048-MSS, Categorized C/O

This TR recommended that each utility review TBV and ADV preventive maintenance (PM) programs and revise them as necessary to include specific activities such as: disassembling and inspecting pneumatic modules on valve actuators, replacing diaphragms, cleaning or replacing air filters, testing backup air supply bottles and relays, calibrating the instrument strings and E/P converter at least once per cycle, performing a circuit check to verify proper functioning of the valve control system from the ICS module through the

actuator, lubricating actuator and valve stems, adjusting actuator spring and valve travel, and checking limit switch operation and position indication, etc.

ANO-1 evaluated the recommended PM activities through PM Engineering Evaluation (PMEE) 022, "Air Operated Valves." The instructions and steps necessary for performance of PM activities on the TBVs, ADVs and related instrumentation and components are provided in the following procedures: (1) Procedures 1413.022 and 1413.263, which provide steps necessary to perform PM activities related to the TBVs and ADVs, respectively, at 18 month intervals; (2) Procedures 1413.054 and 1413.073, which apply to the TBVs and ADVs, respectively, and are performed at 6 year intervals; (3) Procedure 1413.194, which addresses the calibration and loop checks of the steam generator pressure loops at 18 month intervals; (4) procedure 1413.195, which addresses the calibration and loop checks of main steam header pressure loops at 18 month intervals; and (5) Procedure 1413.312, which addresses the inspection, cleaning and changing of the air filter, adjusting and testing for leaks on the ADV air regulators at 18 month intervals.

The staff reviewed the above information, found all to be acceptable, and therefore, concluded that TR-048-MSS had been satisfactorily implemented.

TR-066-MFW, TR-179-MFW, Both Categorized E/I

TR-066-MFW recommended that each utility check all condensate/feedwater system protective circuits, interlocks, motors, and other necessary electrical equipment for system operation to ensure that no single electric failure would cause a loss of both feedwater trains. TR-179-MFW recommended that each utility evaluate and identify areas for enhancing the reliability of the condensate/feedwater systems and controls, with attention given to preventing failure of an active component from causing a loss of all feedwater, and to make changes identified in this evaluation as practical.

The staff found that Entergy Operations, Inc. had not taken action to implement these TRs until April 1990. In an Entergy Operations, Inc. internal meeting on April 18, 1990, it was determined that TR-066, TR-179 and TR-082 should be grouped together and that a consultant should be retained to complete the evaluation. In a memo dated August 17, 1990, Entergy Operations, Inc. indicated that the evaluation of these 3 TRs would be performed by Babcock & Wilcox (B&W). A draft proposal for this evaluation from B&W has been received. Entergy Operations Inc. indicated that the contract with B&W would be implemented in the near future and that the E/I phase would be completed by October 30, 1990. Entergy Operations, Inc. and ANO-1 could not provide a scheduled implementation completion date but stated that implementation could potentially be completed by the 10th refueling outage in the Spring of 1992.

The staff reviewed the above information, and concluded that TR-066-MFW and TR-179-MFW had not been satisfactorily implemented to date.

TR-071-MFW, Categorized C/O

This TR recommended the installation of valve position indication for the startup and MFW regulating valves and low load control valves to provide actual

valve position indication in order to eliminate confusion and allow faster operator response during upset conditions.

The ANO-1 feedwater configuration has 3 parallel feedwater paths to each steam generator, i.e., Main, Low Load, and Startup paths. Flow regulating valves are only installed in the Startup and Low Load lines. There are no "main" feedwater regulating valves. Therefore, the only valves affected by this TR are the Low Load and Startup valves. During Refueling Outage 7, ANO-1 installed the analog position indicators for the Startup and Low Load valves per Design Change Package DCP 85-1089. The existing valve position transmitters with limit switches in the Bailey Control Stations for the feedwater startup and low head control valves were removed and replaced with analog position indicators. The staff reviewed the above information, found it acceptable, and therefore, concluded the TR-071-MFW had been satisfactorily implemented.

TR-098-MFW, Categorized C/R

This TR recommended that the MFW system design be upgraded to include an operational, automatic overfill protection function to prevent loss of heat sink or water inventory in the main steam lines.

Entergy Operations, Inc. determined that automatic overfill protection as a separate and redundant system at ANO-1 is not necessary based on the following: (1) the existing Rapid Feedwater Reduction circuit (RFR) at ANO-1 meets the intent of this TR by post-trip zeroing of the MFW pump speed demands and closure of the Startup and Low load control valves, (2) the MFW block valves are fast closed immediately on a reactor trip, (3) a control room annunciator is provided for high steam generator level, and (4) operator intervention is available. Entergy Operations stated that these measures are adequate to prevent a loss of heat sink or water inventory in the main steam line.

However, NRC Generic Letter (GL) 89-19 required that all PWR plants provide automatic steam generator overfill protection. Specifically, GL 89-19 recommended that all B&W plant designs have automatic SG overfill protection to mitigate MFW overfeed events and that the design for the overfill protection system should be sufficiently separated from the MFW control system to ensure that the MFW pump will trip on a SG high level signal when required, even during a loss of power, a loss of ventilation, or a fire in the control portion of the MFW control system. Entergy Operations, Inc. in a letter to the NRC dated March 19, 1990, indicated that the concerns of GL 89-19 would be addressed in ANO-1's submittal. They also indicated that the original ANO-1 emergency feedwater initiation and control (EFIC) system design included the steam generator overfill protection system. However, the overfill protection feature was removed from the EFIC system because of the concern over the adverse consequences of spurious operation.

The staff reviewed the above information, found it acceptable, and therefore concluded that TR-098/MFW had been justifiably rejected. However, since the staff is currently reviewing and evaluating the implementation of GL 89-19, further actions may be required per the resolution of GL 89-19.

TR-155-EFW, Categorized C/O

This TR recommended that each utility (1) consider a means to limit the maximum flow rate delivered by the EFW system, (2) make plant-specific modifications to limit EFW flow when OTSG level is increased to the natural circulation level setpoint for plants currently without auto flow limits, and (3) evaluate whether a EFW pump runout condition is applicable to their plant and evaluate the consequences.

The first two recommendations were developed in order to reduce the potential for overcooling at plants having significantly more EFW capacity than is needed for decay heat removal. ANO-1 has installed an EFIC system to automatically initiate and control EFW and maintain a specific steam generator level to avoid overcooling. This design aligned EFW to the high OTSG nozzles which is the required system configuration to establish the driving head for natural circulation cooling. The EFIC rate limiter and flow limiter circuitry receive inputs proportional to SG pressure in order to mitigate the effects of an overcooling transient. The OTSG fill rate is controlled from OTSG outlet pressure. Level rate control varies linearly from 8 inches/minute at 1050 psig to 2 inches/minute at 800 psig. Thus, the system will initially supply high EFW flow for the maximum expected decay heat levels, but will automatically throttle back if overcooling becomes apparent. In the event of a failure in the level control components which results in a 100% open flow control valve, the ANO-1 operators have several procedurally controlled methods to reduce EFW flow to acceptable rates.

The third recommendation was developed to provide protection against EFW pump runout in the event of a main or EFW line rupture, or a steam line break. Entergy Operations, Inc. has performed an evaluation and determined that EFW pump runout at ANO-1 could only occur under a very limited set of conditions where multiple failures occur simultaneously and which leave both steam generators in service, at low pressure (approximately 625 to 675 psig), with one pump in service, and the level control valves kept 100% open with persistent high demand for EFW flow. Upon receipt of an isolation signal and MSIV closure, pressure would recover in at least one steam generator while the other would be isolated by the Feed-Only-the-Good-Generator (FOGG) logic. Once steam generator isolation occurs or pressure returns to a value above 700 psig in either steam generator, the runout condition is terminated. In addition, operators have several acceptable actions by which to respond to this low probability event, e.g., initiating main steam line isolation and closing the MSIVs, or overriding the flow control valves.

The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-155-EFW had been satisfactorily implemented with one exception. Formal closeout documentation did not exist for this TR. Entergy Operations, Inc. decided to change this TR's status to "Implementation" until appropriate documentation was in place.

TR-163-EFW, Categorized C/O

This TR recommended that each utility review the EFW surveillance and test procedures to ensure that components used in emergency or abnormal operating procedures were included in that program as this would enhance system reliability. The TR also recommended that these components be tested as near

as possible to the expected operating conditions tc demonstrate the ability to perform their intended function(s).

Entergy Operations, Inc. reviewed the relevant procedures with regard to this TR. Procedure 1106, "Emergency Feedwater Pump Operation," provides test supplements to demonstrate operability of both emergency feedwater (EFW) pumps, EFW system control valves, and flow path and auto actuation verification. Supplements 1 and 2 respectively, provide steps for monthly full flow tests through the recirculation lines to demonstrate operability of the Electric EFW pump (P7B) and Turbine-driven EFW pump, and selected system check valves. Supplement 3 provides quarterly test steps to demonstrate operability of EFW system flow path MOVs by full stroke exercising the valves and measuring stroke times, and verifying partial stroking of EFW Service Water supply check valves. Supplement 4 demonstrates operability of each EFW train by initiating EFIC and verifying that each automatic valve in each flow path including the steam supply valves to the EFWP turbine position properly, and that EFW pump P7B auto starts and provides adequate feed flow to each SG, and that the EFW components can be operated manually by overriding the auto signals.

Supplement 1 of 1105.005 verifies operability of the Main Feed and Main Steam isolation valves by exercising the valves 5% and 10%, respectively. This test also checks loss of power alarm circuitry for the valves' local control panels C186 and C187.

Supplement 2 of 1105.005 verifies operability of the EFIC system and actuated components following a simulated actuation.

Procedure 1304.086 checks and calibrates the pressure, level, and temperature instrumentation associated with the A and B steam generator loops.

Procedure 1304.006 assures proper calibration of the Condensate Storage Tank instrumentation and verifies proper actuation of the alarms.

Procedure 1304.005 assures proper testing and calibration of the EFW flow instrumentation.

The staff reviewed the above information, found it acceptable, and therefore, concluded that TR-163-EFW had been satisfactorily implemented to date and justificably closed. However, since the safety related MOV testing and surveillance program is currently under NRC staff review per requirement of generic letter GL 89-10, further actions may be required per the resolution of GL 89-10.

4.0 CONCLUSIONS - SPIP PROGRAMMATIC AND IMPLEMENTATION AUDITS

During the programmatic audit, the staff reviewed the disposition of 35 TRs and concluded the following:

(1) Entergy Operations, Inc. and ANO-1 had established a formal TR disposition process governed by the Transient Reduction Program (TRP) policies and procedures that adequately controlled the disposition of SPIP TRs with the exceptions that the TRP procedures required neither written justification

for evaluation or implementation schedule slippage, nor reprioritization of TRs with schedular slippage, nor a final implementation due date.

(2) ANO-1 had established and maintained TR files which were complete, auditable, and adequately supported the decisions regarding TR disposition.

(3) The decisions made regarding TR intent and applicability during the E/A and E/I reviews were satisfactory and led to proper TR disposition and that the SPIP program included the necessary self assessment mechanisms to ensure the continued adequacy of the decisions regarding TR disposition.

(4) TRs were being implemented in a timely manner with one exception that management was not placing enough emphasis on timely completion of TRs that had schedular slippage.

(5) There was adequate corporate and site management involvement in the SPIP program; personnel involved in the SPIP program were knowledgeable with respect to their SPIP duties and responsibilities; good communication channels existed between SPIP organizations.

During the Implementation Audit, the staff reviewed the implementation of 21 TRs and concluded the following. The staff found that in most cases the TRs reviewed had been satisfactorily implemented or were in the process of being satisfactorily implemented, had satisfactory hardware and/or software changes that met the intent of the TRs, had acceptable analysis that verified the existing plant procedures or design met TR intent, had acceptable justification basis for rejection, and had acceptable analysis to support non-applicability. In addition, the staff also found that good communication channels existed between Entergy Operations, Inc. and ANO-1 personnel. The staff also found that the weaknesses identified during the programmatic audit had been strengthened. Therefore, the staff concluded that Entergy Operations, Inc. and its Arkansas Nuclear One, Unit 1 had established a SPIP program that satisfactorily controlled the disposition and the implementation of the majority of the BWOG SPIP TRs. However, the staff recommends that Entergy Operations, Inc. and ANO-1 strengthen the implementation proceedings associated with TR-123-IAS, TR-006-MFW, and TR-179-MFW.

Dated: December 19, 1990

Principal Contributor: Y. Hsii, Reactor Systems Branch

APPENDIX A

IDENTIFICATION OF TRs REVIEWED, TR STATUS, AND CONCLUSION STATEMENT

Instrumentation and Control System (ICS)
Instrument Air System (IAS)
Motor Operated Valves (MOV)
Emergency Feedwater (EFW)
Operations (OPS)
Plant Electrical Systems (PES)
Main Turbine System (MTS)
Main Feedwater System (MFW)

TR	Status 8/30/90	Comments on Implementation/Recommendations
117-PES	C/O	Satisfactorily Implemented
190-ICS	C/O	Satisfactorily Implemented
038-ICS	I	Satisfactory Implementation to date
107-ICS	C/O	Satisfactorily Implemented
001-ICS	C/O	Satisfactorily Implemented
104-ICS	I	Satisfactory Implementation to date
119-PES	I	Satisfactory Implementation to date
125-IAS	I	Inadequate Implementation to date
159-OPS	C/O	Satisfactorily Implemented
181-OPS	C/O	Satisfactorily Implemented
041-MOV	C/O	Satisfactorily Implemented
045-MOV	C/O	Satisfactorily Implemented
099-OPS	C/O	Satisfactorily Implemented
096-MSS	C/O	Satisfactorily Implemented
048-MSS	C/O	Satisfactorily Implemented
066-MFW	E/I	Inadequate Implementation to date
179-MFW	E/I	Inadequate Implementation to date
071-MFW	C/O	Satisfactorily Implemented
098-MFW	C/R	Justifiably Rejected pending resolution of GL 89-19
155-EFW	I	Satisfactory Implementation to date
163-EFW	C/O	Satisfactorily Implemented pending resolution of GL 89-10

APPENDIX B

LIST OF ATTENDEES AT THE ENTRANCE AND EXIT MEETINGS
AP&L AND ANO-1 SPIP IMPLEMENTATION AUDIT
AUGUST 27-30, 1990

Attendee	Organization/Title	Entrance	Exit
A. E. Nolan	EG&G/INEL	X	X
M. Yost	EG&G/INEL	X	X
Y. Gene Hsii	NRC/NRR	X	X
T. Alexion	NRC/NRR		X
M. F. Runyan	NRC/Reg IV	X	X
R. M. Cooper	Entergy Ops/TRPC Coordinator	X	X
J. J. Fisicaro	Entergy Ops/Mgr. Licensing	X	X
D. Williams	Entergy Ops/Proj. Mgr.	X	X
J. D. Vandergrift	Entergy Ops/Plant Mgr.	X	X
R. N. Johannes	Entergy Ops/Outage Manager	X	X
R. J. King	Entergy Ops/Supv. Licensing	X	X
J. R. Montgomery Jr.	Entergy Ops/Plant Asses.	X	
C. P. Zimmerman	Entergy Ops/Operations Mgr.	X	X
A. Cox	Entergy Ops/Sys. Eng Mgr.	X	
J. W. Yelverton	Entergy Ops/Dir. Nuc. Ops.		X
E. Rogers	Entergy Ops/Supt. Maint. Eng.		X

the BWOG SPIP TRs. However, the staff also identified minor weaknesses in the implementation proceedings associated with a few TRs (TRs 125, 066, and 179) which are discussed in the enclosed safety evaluation report.

This completes our efforts on TAC 68199.

Sincerely,

ORIGINAL SIGNED BY:

Thomas W. Alexion, Project Manager
Project Directorate IV-1
Division of Reactor Projects III, IV, and V
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc w/enclosure:
See next page

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