

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-313/92-01
50-368/92-01

Dockets: 50-313
50-368

Licensee: Entergy Operations, Inc.
Route 3, Box 137G
Russellville, Arkansas 72801

Facility Name: Arkansas Nuclear One (ANO), Units 1 and 2

Inspection At: ANO, Russellville, Arkansas


Inspection Conducted: February 24-28, 1992

Inspectors: T. O. McKernon, Reactor Inspector, Operational Programs
Section, Division of Reactor Safety

J. E. Whittemore, Reactor Inspector, Operational Programs
Section, Division of Reactor Safety

J. DeBor, Consultant

Approved:


T. F. Stefka, Chief, Operational Programs Section, Division of Reactor Safety

4/6/92
Date

Inspection Summary

Inspection Conducted February 24-28, 1992 (Report 50-313/92-01; 50-368/92-01)

Areas Inspected: Routine announced followup inspection of the Unit 2 emergency operating procedure (EOP) upgrade program and procedures. The inspection also reviewed the status of the Unit 1 emergency operating procedures upgrade program.

Results: The inspectors observed a significant improvement in the Unit 2 EOPs resulting in a quality EOP product. There appeared to exist a high degree of ownership by the operators of the procedures, and a noticeable pride among the staff was evident. In addition, a readily recognizable linkage between the operations and training department existed. One concern was identified related to the EOP verification process in that the licensee had not evaluated the potential for environmental hazards to operators performing local action steps. The licensee committed to revise the validation and verification (V&V)

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procedure and evaluate local action steps prior to the first revision of the new EOPs. These actions are scheduled to be completed by August 15, 1992. An inspection followup item (368/9201-01) was identified in paragraph 2 for further review of licensee actions in this area. Within the scope of the inspection, no violations or deviations were identified.

DETAILS

1. PERSONNEL CONTACTED

Entergy Personnel

- *N. Carns, Vice President Operations
- *J. Yelverton, General Manager Operations
- *R. Fenech, Unit 2 Plant Manager
- *R. Edington, Unit 2 Operations Manager
- *L. Humphrey, Director Quality
- *R. King, Supervisor, Licensing
- *R. Espolt, Assistant Unit 2 Operations Manager
- *M. Chisum, Assistant Unit 2 Operations Manager
- *D. Sealock, Supervisor, Simulator Training
- *P. Williams, Nuclear Safety Analysis
- *S. Boncheff, Licensing Specialist
- E. Jacks, Unit 1 Operations Standards
- J. Mahan, Licensed Operator Training Instructor
- T. Mayfield, Licensed Operator Training Instructor
- J. Head, Supervisor, Design Engineering
- C. Turk, Manager, Design Engineering

NRC Personnel

- *T. McKernon, Reactor Inspector
- *L. Smith, Senior Resident Inspector
- *S. Campbell, Resident Inspector
- *J. Whittemore, Reactor Inspector

Consejo de Seguridad Nuclear (CSN)

- *A. Munuera, Observer

*Denotes those individuals attending the exit interview.

2. FOLLOWUP ON CORRECTIVE ACTIONS FOR VIOLATIONS AND DEVIATIONS (92702)

(Closed) Violation (368/9001-01): Failure to establish and maintain appropriate plant procedures. During the original inspection of Unit 2 Emergency Operating Procedures (EOPs), the inspectors identified four examples of inadequate procedural instructions and four examples of inadequate verification and validation (V&V) of the procedure. During this inspection, the acceptability of the EOPs was again evaluated. Based on the findings discussed below, all of the original concerns have been resolved with the exception of the V&V process. However, the inspectors determined that the remaining concerns were of a lesser concern than those presented in the original Notice of Violation. Therefore, this violation is closed.

The acceptability of the V&V process will be further evaluated as Inspection Followup Item 368/9201-01, see paragraph 4.

This violation is closed based upon the findings of the EOP followup inspection discussed in Section 3 of this inspection report.

3. UNIT 2 EMERGENCY OPERATING PROCEDURES (IP 42001)

3.1 Review of EOPs and Supporting Procedures

The inspectors conducted an in-depth human factors review of EOPs where significant human factors changes had been made. In the case of ANO-2, significant changes were made throughout the EOP and abnormal operating procedure (AOP) network as a result of the conversion to upgraded procedures based on the Combustion Engineering Emergency Operating Procedures Guidelines, CEN-152, Rev. 03.

In order to perform this evaluation, the inspectors reviewed:

- o Procedure 1015.20, ANO-2 EOP Writers Guide, Revision 0;
- o Procedure 1015.21, ANO-2 EOP Users Guide, Revision 0;
- o Procedure 1015.022, EOP Verification and Validation, Revision 1;
- o Procedure 2201-002, Standard Post Trip Actions, Revision 0; and
- o Procedure 2202.004, Steam Generator Tube Rupture, Revision 0.

The EOP Writers Guide provided writing instructions for the development of new EOPs and their revisions. Based on human factors principles and defined plant-specific conventions, this document provided direction to enable the procedure writer to write EOPs that were complete in content and consistent in format to assure that the EOPs were readable, understandable, and executable by control room and in-plant operators.

The ANO-2 EOP Users Guide provided instructions to the operator on the use of the new EOPs. Additionally, the guide defined the terms used in the EOPs and provided instruction on the organization and format of the procedures. The guide also addressed a place-keeping methodology prescribed for the EOPs, which was designed to be helpful to the operator.

The EOP V&V procedure outlined the processes used at ANO for ensuring the accuracy and effectiveness of the EOPs. It included the requirements to be met for V&V activities to ensure that procedure generation, review, and revision was in accordance with guidelines established in NUREG-0800, "Standard Review Plan," and NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures." This document included a specific "Human Factors Review Checklist" that addressed:

- o Procedure logic;
- o Information sufficiency;
- o Labeling and nomenclature;

- o Control display nomenclature;
- o Availability of instrumentation;
- o Nomenclature consistency;
- o Suitability of instrumentation;
- o Calculations;
- o Units of measure;
- o Usability of charts and graphs;
- o Local actions; and
- o Operator aids.

The inspectors reviewed a sample of EOPs for technical adequacy and operational correctness. These sampled procedures were reviewed against basis documentation consisting of the ANO-2 specific EOP technical guidelines, the setpoint document, and deviation documentation. This effort also included a review of the plant specific technical guidelines against CEN-152. The procedures reviewed included Standard Post-Trip Actions, Steam Generator Tube Rupture, Loss of Feedwater, Station Blackout, and Functional Recovery Heat Removal Success Path Four (HR-4).

All discrepancies identified during this review appeared to be minor and were quickly resolved or answered by the licensee. The inspectors agreed with the licensee's assessment that the cause of these discrepancies was that the deviation documentation lacked detail in some areas. The inspectors also noted that new, deviation documentation was in the approval process. A review of the new unapproved documentation indicated that the lack of detail was being addressed. The inspectors had no other concerns in this area.

Based on a review of the Writers Guide, Users Guide, V&V Procedures, and implemented EOPs, the inspectors concluded that the human factors principles had been adequately incorporated into the development and implementation of the ANO-2 EOPs and AOPs. Based on the review of individual EOPs against the basis documentation, the inspectors determined that the technical adequacy and operational correctness of the EOPs had been assured and was satisfactory.

3.2 Use of EOPs and Supporting Procedures

The inspectors walked down the following procedures with licensed or non-licensed operators as appropriate:

- o Procedure 2201.001, Standard Post Trip Actions;
- o Procedure 2201.004, Steam Generator Tube Rupture;
- o Procedure 2203.038, Primary to Secondary Leakage, Revision 0;
- o Secondary Radiation High Annunciator Alarm Procedure;
- o Procedure 2201.009, Functional Recovery Success Path HR-4 Local Actions.

The walkdowns in the Unit 2 control room included a review of the:

- o Entry conditions;
- o Exit conditions;

- o Instructions;
- o Contingency actions; and
- o Diagnostic actions.

The purpose of the procedure walkdowns was to verify that the EOPs and supporting procedures could be physically and correctly performed inside and outside the control room.

An example of how the ANO-2 EOP and AOP network functioned was demonstrated in the "Diagnostic Actions" chart at the end of Procedure 2201-002, Standard Post Trip Actions. The diagnostic actions chart was designed to guide the operator to the correct EOP or AOP following a reactor trip. The overall procedures network at ANO-2 consisted of 10 EOPs and attachments, and about 30 AOPs.

Using the example of steam generator tube rupture symptoms, the inspectors were able to correctly follow the operators diagnostic actions from a reactor trip to Procedure 2202.004, Steam Generator Tube Rupture. In addition, the inspectors verified that all EOPs and AOPs were referenced in the diagnostic actions flow chart.

The inspectors determined that procedures for directing operator actions from a secondary system radiation-high annunciator alarm through the abnormal procedures for primary to secondary leakage through standard post-trip actions, diagnostic actions, and steam generator tube rupture actions could be physically performed correctly in the proper sequence. In addition to the control room walkdowns, the inspectors verified the above findings during simulator exercises.

In addition to the procedure walkdown effort, the inspectors assessed the usability of the procedures by observing the operation of the plant specific simulator. The simulator evaluations were performed using a normal crew of licensed operators plus a shift engineer. Walkdowns of EOP local actions had already been performed by inspectors accompanied by operators to verify that local steps could be performed.

The inspectors used the licensee's simulator malfunction database and the simulator supervisor's expertise to construct two scenarios with which to evaluate the effectiveness of selected EOPs. The scenarios were designed for the crew to perform EOP standard post-trip actions, steam generator tube rupture, loss of feedwater, loss of off-site power, and functional recovery. During the performance of the scenarios, AOPs for RCS leakage, primary to secondary leakage, and natural circulation operation were also exercised. The scenarios were also designed to make it possible for the inspectors to observe event diagnosis, transition to the correct procedures, and use of procedural attachments. Each of the two scenarios had been designed to run 60-75 minutes, and were run for a single crew in back-to-back sessions with a debrief after each session. During the problem exercises, some minor problems were identified by the inspectors and licensee personnel. Typical examples of

the problems determined to be the result of procedural deficiencies are noted below:

- o When an operator attempted to initiate auxiliary pressurizer spray during loss of off-site power conditions, the indication specified for use in Attachment 27, PZR Spray Operation, to preclude thermally shocking the spray nozzle was not available due to the loss of power.
- o While attempting to satisfy the Safety Function Status Check (SFSC) for containment isolation during a steam generator tube rupture, the shift engineer was forced to use other indication than that listed in the procedure because the containment isolation signal had isolated the specified containment atmosphere monitor.
- o During loss of feedwater conditions, the crew regained feedwater flow by starting a main feed pump. However, the restrictive reactor coolant pump restart criteria, which requires certain specific plant conditions for pump start, prevented the crew from quickly restoring reactor coolant system forced circulation because of a fluctuating feed rate and subsequent oscillating cool down rate.

As stated above, these problems were typical of those identified by the inspectors and the licensee. The licensee was made aware of all inspector identified problems. The licensee was planning to address all identified problems in the planned first procedure revision. In spite of the problems encountered, the crews were able to maintain the facility in a safe condition and attain the desired results.

The inspectors observed crew performance to gauge how effective the procedure familiarization and usage training had been. The crew members consistently displayed a questioning attitude, correctly diagnosed events or conditions, entered the correct procedure, and communicated effectively. The operating crew members made a significant contribution toward identifying problems during the post-scenario debriefings.

During EOP walkdowns, licensed operators were able to quickly locate controls and affected indications. Additionally, they demonstrated a good ability to explain the proper manipulation of controls and the expected instrumentation response for actions required by the EOP. They were also able to effectively branch into other EOPs and supporting procedures. Non-licensed operators appeared to have a better than average knowledge of the EOPs and a good understanding of how they were used. They were also able to quickly locate components that required local action and accurately explain how the components were manipulated. During conversations with management personnel, it became apparent that it was an operations department policy to have non-licensed operators observe evolutions in the control room whenever possible. They were also encouraged to be present in the simulator during requalification training sessions.

Based on the sample walkdowns and simulator evaluations, the inspectors determined that the EOPs and supporting procedures could be physically and correctly performed both inside and outside the control room. Except for the minor problems revealed during the simulator sessions for which the licensee had immediately initiated corrective action, there were no concerns about procedure usability.

3.3 Knowledge and Performance of Duties

The inspectors assessed the operators' knowledge and performance in the execution of the EOPs to verify that the licensed and non-licensed operating staff was aware of and understood all significant changes to the EOPS.

During informal interviews conducted in parallel with walkdowns, the inspectors determined that the ANO-2 operators had received classroom and simulator training on the upgraded EOPs prior to the February 24, 1992, inspection. The operators interviewed by the inspectors demonstrated a current understanding of the new EOP entry conditions, exit conditions, action steps and contingency action steps. In addition, the inspectors evaluated operator team performance during simulator scenarios. The simulator scenarios included malfunctions to simulate station blackout, loss of feedwater, primary to secondary leakage, and steam generator tube rupture. In all cases, the operating crew demonstrated a knowledge of the new procedures.

The inspectors determined that the licensee had developed and implemented a training program to familiarize licensed operators and licensed operator candidates with the new format EOPs. Procedures had also been implemented to provide for continuing training to address future procedure revisions. The development of the familiarization training had been completed in time to allow starting the training 5 months prior to the implementation date. The inspectors reviewed all aspects of the training effort to assure that the entire program was performance-based and effective.

The program to initially familiarize licensed personnel with the new procedures had been completed. The inspectors reviewed the lesson plans and the simulator training scenarios that were used for this training effort. In addition, licensee personnel involved in the development and administration of the training were interviewed to assess the effectiveness of the training.

A classroom lesson plan that provided an overview of the EOPs had been developed and administered to licensed operators. This lesson plan provided generic information to familiarize the operators with safety functions, optimal recovery, functional recovery, new terms used in the EOPs, two-column format, floating steps, and continuous action steps. The lesson plan also addressed usage of the EOPs. In addition, a classroom lesson plan had also been developed and administered to all operating crews for each EOP. These lesson plans contained learning objectives requiring licensed operators to:

- o Understand what was being accomplished by the procedure;

- o Memorize entry conditions for Procedure 2202.001, Standard Post Trip Actions, and understand the entry conditions for the remaining EOPs;
- o Know the purpose of and how to satisfy safety functions;
- o Determine which procedure to use, through diagnosis;
- o Know individual crew member responsibilities;
- o Know how to use the place keeping page; and
- o Know the requirements to enter the functional recovery procedure.

This class room training had been administered over a 20-hour period during the requalification program training for Cycles 91-01 and 91-02.

Simulator malfunction scenarios had been developed to familiarize licensed operators and shift engineers with the new EOPs. These scenarios were utilized for familiarization only and were not part of the normal examination or training scenario complement. These scenarios were administered to all crews during requalification Cycles 91-01 and 91-02. During these simulator sessions, evaluation was performed by simulator training instructors as well as operations management and supervisory personnel. Operator performance or knowledge problems were addressed and corrected on the spot. According to licensee training personnel, minor performance problems were identified on two of the six crews. These problems were corrected before administering additional training. These familiarization scenarios were administered to each crew within an approximate 22-hour elapsed time-frame.

The inspectors reviewed the scenarios and determined that administering the complete set would require the crew to enter all EOPs at least once. All but two of the EOPs would be entered and executed at least twice. The inspectors also determined that the scenarios heavily emphasized diagnosis and transition into and out of all EOPs.

The licensee's training department had nearly completed the simulator scenarios to address the new EOPs to support the requalification and initial licensed operator training programs. The only EOPs which had not been integrated into both of these programs were the procedures for loss of off-site power and station blackout. The development schedule called for this work to be completed prior to the next requalification examinations and initial licensed operator examinations, respectively. Continuing training on the EOPs was to be scheduled and implemented via the licensee's licensed operator requalification training program.

During the entire familiarization period, before the new EOPs were approved for use, informal validation occurred by soliciting input from the operators, usually after training sessions. This input was assembled by the assistant operations manager, evaluated, and integrated into the procedures where

applicable. Once the EOPs were finalized and approved, a process governed by existing administrative procedures was implemented to provide for changes in all aspects of EOP training that would result from changes or revisions to the EOPs. According to Procedure 1015.011, Operating Procedure Revision Control, the manager of operations was responsible for identifying the need for training or changes to existing training. These needs were identified to the training organization which resulted in the analysis, development, and administration of the required training in accordance with applicable training department administrative procedures.

The inspectors determined that the training which had been administered to familiarize control room operators with the new EOPs had been effective. The effort being expended to develop initial and requalification training to support the procedures, was deemed to be successful to the point it had been completed. The inspectors also observed that an excellent working relationship existed between the operations and training organizations at all levels within both organizations. There were no concerns in the training area.

The inspectors concluded that the licensee's operating and support staffs were aware of and understood the significant changes to the ANO-2 EOPs.

3.4 Review of Licensee EOP Programmatic Controls

The purpose of this assessment was to verify that the licensee's administrative procedures adequately governed the program for controlling changes to the EOPs and to assess the effectiveness of the licensee's self assessment efforts to identify problems with the EOPs.

The inspectors reviewed the licensee's process for revision of the EOPs and the requirements for EOP validation and verification. EOP revision was performed in accordance with Procedures 1000.006, Procedure Control, and 1015.011, Control of Operating Procedure Revision. These administrative procedures controlled revision of all operating procedures. The procedure allowed any site employee to suggest procedure revision through submission of a procedure improvement form (PIF). Suggested changes were subjected to a review process to determine if a recommended change was needed or desirable. If a change was determined to be necessary, a procedure writer was assigned to make the change. Prior to implementing the change, a strenuous review and approval process was completed.

Licensee personnel stated that 15-20 PIFs per week had been submitted by operations personnel during the initial weeks after the new EOPs had been implemented. After 9 weeks, the submittal rate was approximately 10 PIFs per week, and there were 27 PIFs that had not been dispositioned or closed. All the other submissions had been either approved and integrated into the next scheduled revision or not approved. The operations standards group exercised a policy of coming to resolution with the person submitting the revision for those PIFs which did not result in the suggested change.

In addition to the administrative controls affecting revisions to procedures, the EOPs and AOPs were stored on a Volian Enterprises Procedures Management System. This was an automated procedures management system that assured that any changes made in the procedures network would be made in all other applicable procedure steps. The automated procedures management system also assured that 1 and 2 column formats were consistently maintained and that step numbers were inserted correctly. The system was password protected and only two individuals were allowed access to the system.

Administrative Procedure 1015.022, EOP Verification and Validation, outlined the process for EOP V&V used at ANO. The procedure required both the verification and validation process to be implemented using a team concept. Teams were required to be multi-disciplinary and the process required specific tasks and a check list to be performed by personnel proficient in the area of human factors. The entire V&V process required extensive review to assure the EOPs were technically accurate, written correctly, and operationally correct. The inspectors determined that the V&V process had been performed twice since the procedures had been initially prepared. The licensee recognized that many changes had been made to the EOPs during the operator familiarization effort. These changes were made outside the normal program as the EOPs had not been approved and implemented. The licensee recognized that the original effort may have become invalid after the numerous changes and decided to completely revalidate and reverify the EOPs. This second complete V&V effort was completed during November 1991.

The V&V process mandated the use of Form 1015.022E, Local Action Verification, to assure that EOP local action steps could be performed as stated in the procedure. This checklist consisted of six items to be applied to local action steps to perform this verification. The checklist included a step to verify that lighting and accessibility were sufficient to perform the activity. The licensee interpreted accessibility as physical capability to access and operate the equipment. Local environmental hazards to the operator were not considered. The inspectors were informed by licensee personnel that the new format EOPs included local action steps that were not part of the previous EOPs. When requested by the inspectors, the licensee could not provide any assurance that all local action steps of the EOPs had been evaluated for environmental hazards, principally, radiation exposure to the operator. The licensee appeared to have the information needed to make such an assessment in the form of a contractor assessment report on shielding and accident sampling for both units, dated in December 1979. However, the licensee design engineering group was planning to assess the current validity of this early study, and it was not clear what basis document would be used to evaluate local action step environmental hazards.

The inspectors concluded that the licensee's system for controlling EOP revision had sufficient programmatic attributes to effectively control changes to the EOPs, supporting procedures, and provide for any required training. A further determination was made that the licensee staff understood the procedures and how to implement them correctly. However, the licensee acknowledged that the EOP V&V process needed to be enhanced to consider hazards to the

operator for locally performed steps. The inspectors had no other concerns in the areas of procedure control or the V&V process.

The inspectors determined that a QA audit of the ANO-2 EOPs had been completed on January 17, 1992. A final report had not been issued, but no major problems had been identified. The licensee had identified through feedback from operations and training personnel that the deviation documentation was lacking substance. This finding prompted the licensee to initiate a complete review of the entire EOP program. An outside party was contracted to perform this review on January 29, 1992. The inspectors reviewed the enhanced deviation documentation for two EOPs which had been completed and was ready for approval. It appeared that the licensee was taking appropriate action to correct the weaknesses in the EOP deviation documentation. The inspectors concluded that the licensee was performing effective self-assessment on the Unit 2 EOP program.

4. EXIT MEETING

The inspectors conducted an exit meeting with the personnel listed in paragraph 1 on February 28, 1992. The inspectors discussed the inspection scope and related findings. The licensee did not identify as proprietary any of the material provided to the inspectors during the inspection.

During this exit meeting licensee management personnel committed to evaluate EOP local action steps for environmental hazards to operators prior to the next revision of the EOPs. Additionally, the licensee committed to address the generic implications of this finding by changing the EOP V&V process to require that local action steps be evaluated considering potential local environmental hazards to the operator. This will be reviewed during a future inspection and will be tracked as Inspection Followup Item 368/9201-01.