APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-313/92-23
50-368/92-23

Operating Licenses: DPR-51
NPF-6

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: August 31 through September 4, 1992

Inspector: R. C. Stewart, Reactor Inspector, Materials and Quality Programs Section, Division of Reactor Safety

Approved: Dwight D. Chamberlain for 9-30-92
I. Barnes, Chief, Materials and Quality Programs Section, Division of Reactor Safety — Date

Inspection Summary

Areas Inspected: Routine, unannounced inspection of the licensee's boric acid corrosion prevention program procedures and implementation required by Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants."

Results:

- Program

  In general, the principal elements of the licensee's boric acid corrosion prevention program met or exceeded the intent of GL 88-05. Implementing procedures appeared to provide clear and specific requirements in minimizing boric acid leakage. This aspect of the program was considered a strength (paragraph 2.2.2).

  The lack of an administrative procedure (or directive) that would encompass the scope and/or definition of the boric acid corrosion

prevention program was considered a weakness by the inspector (paragraph 2.2.2).

- Program Implementation

  The licensee's records relating to system walkdown inspections were found to be well documented. The numerous RCS walkdowns/ inspections and appropriate corrective actions appeared to be effective in reducing boric acid leakage within the RCS. This was considered an added strength to the boric acid corrosion prevention program (paragraph 2.4).

Summary of Inspection Findings:

- No inspection findings were opened or closed during this inspection.

Attachments:

Attachment 1 - Persons Contacted and Exit Meeting

Attachment 2 - Documents Reviewed

DETAILS

1 PLANT STATUS

During this inspection period, Units 1 and 2 were at their respective operating capacities, therefore, no containment entries were made by the inspector.

2 BORIC ACID CORROSION PREVENTION PROGRAM (62001)

The objectives of this inspection were to verify that the licensee had a documented program for prevention of corrosion caused by boric acid solution leaking out from boric acid containing systems, as required by Generic Letter (GL) 88-05. Additional objectives were to verify that the licensee had prepared procedures which provide clear guidance for performing the activities required by the program and verify that the licensee had implemented the program in accordance with its written procedures.

2.1 GL 88-05 Recommendations

In summary, GL 88-05 recommends that the licensee: (1) determine the principal locations where leaks, smaller than the allowable Technical Specification limit, can cause degradation of the primary pressure boundary by boric acid corrosion. Particular consideration should be given to identifying those locations where conditions exist that could cause high concentrations of boric acid on pressure boundary surfaces; (2) include procedures for locating small coolant leaks (i.e., leakage rates at less than Technical Specification limits) that establish the potential path of the leaking coolant and the reactor pressure boundary components that it is likely to contact; (3) establish methods for conducting examinations and performing engineering evaluations to establish the impact on the reactor coolant pressure boundary when leakage is located; and (4) establish corrective actions to prevent recurrences of this type of corrosion.

2.2 ANO Units 1 and 2 Boric Acid Corrosion Prevention Programs

2.2.1 Program Management

During the inspection, the licensee provided the inspector with numerous documents and procedures which addressed activities associated with the examination, evaluation and reduction of boric acid leakage applicable to each unit (see listing of documents in Attachment 2 of this report). As a result of discussions with the cognizant licensee representatives, it was ascertained by the inspector that the primary responsibility for the implementation of the program was assigned to a boric acid corrosion coordinator. The coordinator reported directly to the supervisor, engineering programs, who in turn reported to the manager, engineering programs. The responsibilities and authority were more definitive in Engineering Standards Procedure 5120.440, "Inspection and Evaluation of Boric Acid Leaks," Revision 0. The inspector

also noted that, with the exception of the ASME Section XI pressure test requirements wherein certified VT-2 quality control inspectors are required and utilized, boric acid leakage monitoring and system walkdowns were principally performed by the operations staff personnel and any identified leakage was required to be investigated and evaluated by the coordinator, engineering programs.

2.2.2 Program Procedures

In response to NRC GL 88-05, the licensee stated in letter (OCAN-58813) dated May 27, 1988, that as a result of AP&L's previous experience with boric acid corrosion on a high pressure nozzle, they had previously taken actions to address boric acid corrosion of the RCS which met the intent of the staff position. The response appropriately addressed each of the four elements noted in paragraph 3.1 above. In addressing each of the four elements, the licensee referred to AP&L requirements, procedures, procedure modifications and development, but did not specifically identify them in the response.

In discussing this matter with the coordinator, it was determined that there were specific sections within each of 13 implementing procedures applicable to the activities associated with monitoring for boric acid leakage corrosion (see listing of procedures Attachment 2 to this report). In reviewing the above procedures, the inspector made the following observations:

- The applicable sections contained within the above referenced procedures appeared to provide clear guidance in the implementing requirements regarding system walkdown inspections which met the intent of Item 2 of the GL 88-05 (see paragraph 3.1 above).

  The lack of an administrative procedure (or directive) that would encompass the scope and/or definition of the boric acid corrosion prevention program, was considered a weakness by the inspector.

- GL 88-05 required the identity of principal locations where smaller than allowable Technical Specification leaks could cause boric acid corrosion on pressure boundary surfaces. The licensee had determined that their requirement to evaluate all RCS leaks regardless of location was more conservative than concentrating on specific locations within the RCS pressure boundary (AP&L response letter dated May 27, 1988). The inspector determined that the licensee's added requirement exceeds the scope of the intent of the GL and is therefore, considered an enhancement to the program. This approach had been further demonstrated by the system walkdown requirements delineated in procedures, "Plant Preheatup and Precritical Checklist," 1102.001, Supplement 5, and 2102.001, Attachment D, Units 1 and 2 respectively. In addition, the inspector observed the following additional plant operations procedures that contained walkdown and sign-off requirements for RCS leakage inspections:

Unit 1

1102.002, "Plant Startup," Section 15.11
1102.010, "Plant Shutdown and Cooldown," Section 11.2.1
1103.013, "RCS Leak Detection," Section 9.0

Unit 2

2102.002, "Plant Heatup," Sections 7.7 and 11.4
2305.002, "Reactor Coolant System Leak Detection"
2102.010, "Plant Cooldown," Section 9.8

- Engineering Standards Procedure 5120.440, "Inspection and Evaluation of Boric Acid Leaks," included established guidelines for investigating boric acid leaks and prescribed the methods for evaluating corrosion associated with boric acid. The procedure applied to all situations in which a potential exits for boric acid to corrode plant components and piping, particularly the reactor coolant system for Units 1 and 2.

  In addition, the procedure is more specific in addressing the requirements of Items 3 and 4 of GL 88-05, wherein clear guidance is provided for performing inspections, investigations, evaluations, acceptance criteria, and corrective actions.

- The licensee's procedures (5120.240, 5120.242, and 5120.243) relative to ASME Section XI, post outage pressure testings and associated VT-2 visual examinations, were observed to be comprehensive in defining applicable components and criteria. These procedures were considered a program strength.

- The licensee's response to Item 4 of GL 88-05 indicated that AP&L was developing a design modification guideline which would address the potential for boric acid corrosion. The cognizant licensee representative provided the inspector with a copy of design engineering directive, DED-I-256, dated December 20, 1988. The directive emphasizes the design methods to minimize the potential for RCS leakage and maximize the ability to detect any RCS leakage that does occur. Also, the use of corrosion resistant materials, when possible, were also addressed. The documentation requirements of the directive were to be contained within each design change package.

2.3 Conclusions - Program Review

In summary, the licensee's implementing procedures, applicable to boric acid corrosion and leakage control, were found to provide clear guidance in system walkdown requirements; leakage evaluation/corrective actions; and design change reviews. These elements of the program met the intent of the GL and reflect the licensee's emphasis on minimizing boric acid leakage within the reactor containment building. This was considered a program strength.

The lack of an administrative procedure (or directive) that would encompass the scope and/or definition of the boric acid corrosion prevention program, was considered a weakness.

2.4 Program Implementation

The inspector selected the documented results of 10 RCS leakage inspections (see listing of documented results Attachment 2) conducted during the periods April 28, 1990 through May 8, 1992 (Unit 1) and March 4, 1990 through May 1, 1992 (Unit 2). The inspector observed that for each walkdown/inspection, leak location and type was clearly identified, including an estimated leakage rate and a corresponding job request number. The inspector also reviewed the documented results of engineering evaluations performed on each of five boric acid leaks identified during system walkdowns (see Procedure 5120.440 in Attachment 2 to this report). The evaluations appeared to be comprehensive in scope, including the requirement for the evaluator to address seven basic observations regarding the leak and the recommended corrective actions. For those evaluations reviewed, the inspector concurred with each of the assessments, however, where corrective action required specific component repairs, the inspector did not verify that the activity had been completed as no containment entry and system walkdown was made by the inspector because of the plant operational status.

2.5 Conclusions - Program Implementation

The documented results of the RCS inspection/walkdowns were indicative of procedural requirements that were effectively implemented, with minimal RCS leakage being maintained. The program implementation was considered a strength of the overall boric acid corrosion prevention program.

ATTACHMENT 1

1 PERSONS CONTACTED

1.1 Licensee Personnel

*M. Cooper, Licensing Specialist
*R. King, Supervisor, Licensing
*D. Lomax, Manager, Engineering programs
*L. Humphrey, Director, Quality
*R. Fenech, General Manager
*M. Little, Unit 1 Operations
*J. Vandergrift, Plant Manager Unit 1
Fisicaro, Director Licensing
dington, Unit 2 Plant Manager
ubanks, Supervisor, Engineering Programs
R. Jones, Engineering Programs
*T. Russell, Unit 2 Operations

1.2 NRC

*L. Smith, Senior Resident Inspector

*Denotes personnel that attended the exit meeting. In addition to the above, the inspector contacted other personnel during this inspection period.

2 EXIT MEETING

An exit meeting was conducted on September 4, 1992. During this meeting, the inspector reviewed the scope and findings of the report. The licensee did not identify as proprietary, any information provided to, or reviewed by the inspector.

ATTACHMENT 2

CORRESPONDENCE

AP&L Letter, dated December 9, 1986, Unit 1 Licensee Event Report 86-006-00

Entergy Letter, dated December 11, 1990, Reactor Coolant System Leak Detection Inspection

AP&L Memorandum, dated November 6, 1986, Workplan for Concentrated Boric Acid Attack on ANO Unit 1 RCS

AP&L Letter, dated May 27, 1988, Response to Generic Letter 88-05 (Correspondence)

NRR Letter, dated August 25, 1988, Response to AP&L Letter dated May 27, 1988 (Correspondence)

PROCEDURES

Procedure 2102.006, "Reactor Trip Review," Revision 14 (Unit 2)

Procedure 1102.010, "Plant Shutdown and Cooldown," Revision 40 (Unit 1)

Procedure 5120.243, "Unit 2 Post Outage Elevated Temperature Pressure Test," Revision 0 (Units 1 and 2)

Procedure 1102.001, "Plant Preheatup and Precritical Checklist," Supplement 5, RCS Leak Test, Revision 50 (Unit 1)

DED: T-256 Design Engineering & Directive, dated December 20, 1988 (Units 1 and 2)

Procured 5120.242, "Unit 1 - Post Outage Elevated Temperature Pressure Test," Revision 0 (Unit 1)

Procedure 5120.440, "Inspection and Evaluation of Boric Acid Leaks," Revision 0 (Units 1 and 2)

Procedure 2102.010, "Plant Cooldown," Revision 24 (Unit 2)

Procedure 5120.240, "Pressure Test," Revision 0 (Units 1 and 2)

Procedure 2102.001, "Plant Preheatup and Precritical Checklist," Revision 37 (Unit 2)

Procedure 1102.002, "Plant Startup," Revision 52 (Unit 1)

Procedure 1103.013, "RCS Leak Detection," Revision 11 (Unit 1)

Procedure 2102.002, "Plant Heatup," Revision 37 (Unit 2)

DOCUMENTED RCS INSPECTIONS

UNIT 1

Procedure 1103.13, Supplement 3, dated April 28, 1990

Procedure 1102.001, Supplement 5, dated December 19, 1990

Procedure 1103.13, Supplement 3, dated December 20, 1990

Procedure 1102.001, Supplement 5, dated January 5, 1991

Procedure 1103.13, Supplement 3, dated September 5, 1991

Procedure 5120.440 (formerly 1092.091) Attachment 1, "Boric Acid Leak Evaluation," dated December 20, 1990, April 23, 24, May 1, and May 8, 1992

UNIT 2

Procedure 2305.02, Supplement 1, dated March 5, 1990

Procedure 2102.01, Attachment D, dated February 25, 1991

Procedure 2102.001, Attachment D, dated October 24, 1991

Procedure 2102.001, Attachment D, dated March 10, 1992

Procedure 2102.001, Attachment D, dated May 1, 1992