UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

August 8, 2005

Jeffrey S. Forbes
Vice President Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72801-0967

SUBJECT: ARKANSAS NUCLEAR ONE, UNITS 1 AND 2 - NRC SAFETY SYSTEM DESIGN AND PERFORMANCE CAPABILITY INSPECTION REPORT 0500313/2005008; 0500368/2005008

Dear Mr. Forbes:

On June 24, 2005, the Nuclear Regulatory Commission (NRC) completed an inspection at your Arkansas Nuclear One, Units 1 and 2, facility. The enclosed Safety System Design and Performance Capability inspection report documents the findings, which were discussed with you and other members of your staff at the conclusion of the inspection.

This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The team reviewed selected procedures and records, observed activities and interviewed personnel.

The report documents four findings that were evaluated under the risk significance determination process as having very low safety significance (Green). The NRC has also determined that violations were associated with three of these findings. The violations are being treated as noncited violations because they are of very low safety significance and because they have been entered into your corrective action program consistent with Section VI.A of the Enforcement Policy. If you contest the violations or the significance of these noncited violations, you should provide a response within 30 days of the date of the inspection report, with the basis for your denial, to the U.S. Nuclear Regulator Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC resident inspector at the Arkansas Nuclear One facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

J. Clark, P.E., Chief
Engineering Branch - 1
Division of Reactor Safety

Dockets: 50-313; 50-368
Licenses: DPR-51; NPF-6

Enclosure:
NRC Inspection Report 05000313/2005008 and 05000368/2005008
w/Attachments: 1. Supplemental Information
2. Information Exempt From Public Disclosure In Accordance With 10 CFR 2.390

cc w/enclosure and Attachment 1:
Senior Vice President
& Chief Operating Officer
Entergy Operations, Inc.
P.O. Box 31995
Jackson, MS 39286-1995

Vice President
Operations Support
Entergy Operations, Inc.
P.O. Box 31995
Jackson, MS 39286-1995

Manager, Washington Nuclear Operations
ABB Combustion Engineering Nuclear
Power
12300 Twinbrook Parkway, Suite 330
Rockville, MD 20852

County Judge of Pope County
Pope County Courthouse
100 West Main Street
Russellville, AR 72801

Winston & Strawn LLP
1700 K Street, N.W.
Washington, DC 20006-3817

Bernard Bevill
Radiation Control Team Leader
Division of Radiation Control and
Emergency Management
Arkansas Department of Health
4815 West Markham Street, Mail Slot 30
Little Rock, AR 72205-3867

James Mallay
Director, Regulatory Affairs
Framatome ANP
3815 Old Forest Road
Lynchburg, VA 24501

Electronic distribution by RIV:
Regional Administrator **(BSM1)**
DRP Director **(ATH)**
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Senior Project Engineer, DRP/E **(VGG)**
Team Leader, DRP/TSS **(RLN1)**
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DRS STA **(DAP)**
J. Dixon-Herrity, OEDO RIV Coordinator **(JLD)**
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ANO Site Secretary **(VLH)**

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.:	50-313, 50-368
License Nos.:	DPR-51, NPF-6
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Units 1 and 2
Location:	Junction of Hwy. 64W and Hwy. 333 South Russellville, Arkansas
Dates:	June 6-24, 2005
Team Leader:	J. I. Tapia, P.E., Senior Reactor Inspector, Engineering Branch - 1
Inspectors:	J. Adams, Reactor Inspector, Engineering Branch - 1 B. Henderson, Reactor Inspector, Engineering Branch - 1 C. Paulk, Senior Reactor Inspector, Engineering Branch - 1
Accompanying Personnel:	C. Baron, P.E., Contractor, Beckman & Associates, Inc.
Approved by:	J. Clark, P.E., Chief Engineering Branch - 1 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000313/2005008, 05000368/2005008;6/6-24/2005; Arkansas Nuclear One, Units 1 and 2; Safety System Design and Performance Capability; Permanent Plant Modifications; Evaluations of Changes, Tests, or Experiments.

The report covered a 2-week period of inspection on site by a team of four region-based engineering inspectors and one consultant. Four Green findings of very low safety significance were identified during this inspection. Three of the findings were classified as noncited violations. The findings were evaluated using the significance determination process. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. Inspector-Identified and Self-Revealing Findings

Cornerstone: Barrier Integrity

- Green. The team identified a violation of 10 CFR Part 50, Appendix B, Criterion XVI (Corrective Action) for failing to properly evaluate the need to place the closing function of the containment sump Isolation Valve 2CV-5650-2 into the inservice testing program despite two opportunities to do so over an 11-year period.

  The finding is greater than minor because it had the potential to affect the Barrier Integrity cornerstone objective of ensuring that physical barriers protect the public from radionuclide releases, in that, failure of the valve to close could release radioactivity from containment following an accident. The violation was of very low safety significance because there was never an actual open pathway from the reactor containment building (Section R21).

Cornerstone: Mitigating Systems

- Green. The team identified a violation of 10 CFR Part 50, Appendix B, Criterion XVI (Corrective Action) for the failure to take prompt corrective actions to address a longstanding problem. In 1993, a design change incorporated an impermeable membrane fabric over the top of the emergency cooling pond dam/spillway. On May 19, 2002, Condition Report CR-ANO-C-2002-00394 was written to document that the fabric was torn, missing in some areas and in need of replacement. At the time of this inspection, the licensee had not initiated actions to repair or replace the damaged and missing portions of the fabric and restore the required design.

  The failure to address this longstanding problem was a performance deficiency. The issue had more than minor safety significance because it impacted the

Mitigating Systems cornerstone objective of ensuring the availability of systems that mitigate plant accidents and could have affected the ability of a safety-related structure to perform its design basis function. The finding was of very low safety significance because the structure remained operable consistent with Generic Letter 91-18, “Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions,” Revision 1, and because it did not represent an actual loss-of-safety function (Section R21).

- Green. The team identified a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failing to assure that a design change to the emergency cooling pond was incorporated into the design basis and the associated technical specification surveillance requirements. As a result, the licensee failed to recognize that the design change reduced the effective volume of the emergency cooling pond and that the surveillance acceptance criteria needed to be revised.

  This finding was more than minor because the emergency cooling pond capacity was degraded because of a reduced volume, which was not detected during the design change nor during subsequent surveillances. Arkansas Nuclear One engineering staff had to perform reanalyses and operability evaluations to address this finding and the minimum required emergency cooling pond level had to be increased to ensure operability. The finding was of very low safety significance because it did not represent an actual loss-of-safety function (Section R21).

- Green. The team identified a finding, in that, the licensee had failed to fully address a vulnerability in the design of the Unit 1 and 2 service water system strainers. Specifically, the design did not include any provisions for bypassing or cleaning the strainers while in service, should they become clogged during system operation. While the licensee does not consider clogging of all strainers a potential common failure mode, the definitions in Appendix A to Part 50 - General Design Criteria for Nuclear Power Plants - indicate that it should be. Specifically, multiple failures resulting from a single occurrence are considered to be a single failure.

  This finding was more than minor because it could affect the availability, reliability, and capability of the service water systems under accident conditions. This design condition was not contrary to any regulatory requirement or the Unit 1 or 2 licensing bases. Consequently, it was not considered to be a violation of regulatory requirements. The finding was of very low safety significance because it did not represent an actual loss-of-safety function (Section R21).

B. Licensee-Identified Violations

None.

REPORT DETAILS

1. REACTOR SAFETY

Introduction

The NRC conducted an inspection to verify that licensee personnel adequately preserved the facility safety system design and performance capability and that licensee personnel preserved the initial design in subsequent modifications of the systems selected for review. The scope of the review also included any necessary nonsafety-related structures, systems, and components that provided functions to support safety functions. This inspection also reviewed the licensee's programs and methods for monitoring the capability of the selected systems to perform the current design basis functions. This inspection verified aspects of the initiating events, mitigating systems, and barrier cornerstones.

The licensee personnel based the probabilistic risk assessment model for the Arkansas Nuclear One Generating Station, Units 1 and 2, on the capability of the as-built safety systems to perform their intended safety functions successfully. The team determined the area and scope of the inspection by reviewing the licensee's probabilistic risk analysis models to identify the most risk significant systems, structures, and components. The team established this according to their ranking and potential contribution to dominant accident sequences and/or initiators. The team also used a deterministic approach in the selection process by considering recent inspection history, recent problem area history, and all modifications developed and implemented.

The team assessed the adequacy of calculations, analyses, engineering processes, and engineering and operating practices that licensee personnel used for the selected safety system and the necessary support systems during normal, abnormal, and accident conditions. Acceptance criteria used by the team included NRC regulations, the technical specifications, applicable sections of the Updated Safety Analysis Report (USAR), applicable industry codes and standards, and industry initiatives implemented by the licensee's programs.

1R02 Evaluations of Changes, Tests, or Experiments (71111.02)

a. Inspection Scope

The team inspected the effectiveness of the licensee's implementation of changes to facility structures, systems, and components, risk-significant normal and emergency operating procedures; test programs; and the updated final safety analysis reports in accordance with 10 CFR 50.59, "Changes, Tests, and Experiments." The team utilized Inspection Procedure 71111.02 for this inspection.

The minimum sample size for this procedure is 6 evaluations and 12 screenings. The team reviewed 8 licensee-performed 10 CFR 50.59 evaluations to verify that licensee personnel had appropriately considered the conditions under which the licensee may

make changes to the facility or procedures or conduct tests or experiments without prior NRC approval. The team reviewed 17 licensee-performed 10 CFR 50.59 screenings, in which the licensee personnel determined that evaluations were not required, to ensure that the exclusion of a full evaluation was consistent with the requirements of 10 CFR 50.59. The team selected evaluations and screenings that had been performed since the last NRC inspection of 10 CFR 50.59 activities.

The team reviewed and evaluated the most recent licensee 10 CFR 50.59 program self assessment to determine whether licensee personnel conducted sufficient in-depth analyses of their program to allow for the identification and subsequent resolution of problems or deficiencies. In addition, the team reviewed four condition reports that were generated to resolve issues associated with the application of the 50.59 process.

b. Findings

No findings of significance were identified.

1R21 Safety System Design and Performance Capability (71111.21)

The minimum sample size for this procedure is one risk-significant system for mitigating an accident or maintaining barrier integrity. The team completed the required sample size by reviewing the service water system in each unit. The primary review prompted parallel review and examination of support systems, such as, power, instrumentation and controls, cooling and related structures and components.

.1 System Requirements

a. Inspection Scope

The team examined the process medium, energy source, control system, and equipment protection attributes of the selected systems. Procedural instructions were reviewed to verify that instructions were consistent with actions required to meet, prevent, and/or mitigate design basis accidents. The team also considered requirements and commitments identified in the USAR, technical specifications, design basis documents, and plant drawings.

b. Findings

No findings of significance were identified.

.2 System Condition and Capability

a. Inspection Scope

The team reviewed the periodic testing procedures for the selected systems to verify that the capabilities of the systems were periodically verified. The team also reviewed

system health reports, as well as a sample of the governing procedures and documentation for the control of calculations that were translated into values used in plant procedures. In addition, the team performed walkdowns of the selected systems to ascertain the material condition of the systems.

The team also reviewed the operation of the systems by reviewing normal, abnormal, and emergency operating procedures. The review included the USAR, technical specifications, design calculations and drawings.

b. Findings

No findings of significance were identified.

.3 Identification and Resolution of Problems

a. Inspection Scope

The team reviewed a sample of problems associated with the selected systems that were identified by licensee personnel in the corrective action program to evaluate the effectiveness of corrective actions related to design issues and aging hardware. The sample included open and closed condition reports and their disposition via work orders, as documented in the licensee's corrective action program. The sample covered the past 3 years and the documents reviewed are listed in the attachment to this report. Inspection Procedure 71152, "Identification and Resolution of Problems," was used as guidance to perform this part of the inspection.

b. Findings

(1) Inadequate Corrective Action to Include Valve in Testing Program

Introduction. The team identified a non-cited violation of very low safety significance (green) for failing to properly evaluate the need to include the closing function of containment sump Isolation Valve 2CV-5650-2 in the inservice testing program. This violated 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," because this condition adverse to quality was examined in 1994 and 1997, and was not identified as a deficiency and corrected until 2005.

Description. Containment Spray System Valve 2CV-5650-2 is a normally closed valve, which isolates the containment sump from the containment spray pump. The primary safety function of the valve is to open and permit flow from the containment sump to the containment spray pump for containment cooling and depressurization following a loss-of- coolant accident after the inventory in the reactor water storage tank has been exhausted. The secondary safety function is to close should the containment spray pump develop a seal leak, which would constitute a path for the escape of radioactively contaminated water from containment.

During a surveillance in March 2005, Valve 2CV-5650-2 opened as designed, but then failed to close. Inspection of the valve revealed that the valve disk was binding in the guides near the fully open position. To prevent recurrence, the valve stem was

lubricated, guides were buffed and a temporary alteration was installed which adjusted the valve actuator such that the valve would not fully open. These actions were intended to avoid moving the valve disk into the area where metal-to-metal contact was causing binding of the disk.

The question of whether the valve's closing function needed to be tested originally surfaced in 1994. At that time, the licensee determined that a seal leak from the containment spray pump could be sufficiently mitigated by stopping the pump and containing the leakage in the water-tight room where the pump is located. In 1997, the issue was again raised during a review of the inservice testing program and it was determined that the closing function did not have safety significance. On both occasions it was not considered necessary to shut the containment isolation valve to prevent release of radioactivity in excess of 10 CFR Part 100 limits.

The issue was revisited again in March 2005 during a review of the failure of the valve to close after the inservice test to open. Licensee engineers now determined that simply stopping the pump was insufficient to preclude leakage from the containment sump into the auxiliary building and a decision was made to include the closing function of the valve in the in-service testing program.

Analysis. The team determined that the failure to place the closing function of the containment sump isolation valve in the inservice testing program was a performance deficiency. The finding was greater than minor because it had the potential to affect the Barrier Integrity cornerstone objective of ensuring that physical barriers protect the public from radionuclide releases in that failure of the valve to close could release radioactivity from containment following an accident. Using the Phase 1 worksheet in Inspection Manual Chapter 0609, "Significance Determination Process," the team assessed this finding as having very low safety significance (Green) because there was never an actual open pathway from the reactor containment building and because the specific accident conditions that could have challenged containment integrity never existed.

Enforcement. 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," states, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. Contrary to this, on two occasions over an 11-year period, the licensee failed to identify that the containment isolation valve safety function of closing was required to be included in the inservice testing program. Because the violation was of very low safety significance (Green) and has been entered into the licensee's corrective action program (Condition Report CR-ANO-2-2005-00396), this violation is being treated as a noncited violation, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000313; 368/2005008-01).

(2) Inadequate Corrective Action to Repair Damaged Structure

Introduction. The team identified that the licensee failed to correct a longstanding problem associated with the material condition of the emergency cooling pond dam/spillway.

Description. In 1993, a design change incorporated an impermeable membrane fabric above the articulated concrete slabs of the emergency cooling pond dam/spillway structure to deter erosion. On May 19, 2002, Condition Report CR-ANO-C-2002-00394 was written to document that the fabric was torn, missing in some areas and in need of replacement. The degraded condition of the impervious membrane fabric was again noted in June 2002 (CR-ANO-C-2002-00525), June 2003 (CR-ANO-C-2003-00863), May 2004 (CR-ANO-C-2004-00929 & CR-ANO-C-2004-00949). Despite these additional condition reports, which noted that water from the pond was eroding the earthwork around the concrete blocks, the damaged fabric was not repaired and brought back into conformance with the design requirements. At the time of this inspection, the licensee had not initiated any actions to repair or replace the damaged and missing portions of the fabric nor the eroded areas of the dam/spillway.

Analysis. The failure to address this longstanding problem was a performance deficiency. The issue had more than minor safety significance because it impacted the Mitigating Systems cornerstone objective of ensuring the availability of systems that mitigate plant accidents and could have affected the ability of a safety-related structure to perform its design basis function. The finding was of very low safety significance (Green) because the structure remained operable consistent with Generic Letter 91-18, "Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions," Revision 1, and because it did not represent an actual loss-of-safety function.

Enforcement. 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," states, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. Contrary to this, the licensee failed to correct a deficient condition and restore the design of the emergency cooling pond dam/spillway impermeable membrane fabric. Because this violation is of very low safety significance and has been entered into the licensee's corrective action program as Condition Report CR-ANO-C-2005-01097. This violation is being treated as a noncited violation consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000313;368/2005008-02).

.4 System Walkdowns

a. Inspection Scope

The team performed walkdowns of the accessible portions of the selected systems. The team focused on the installation, configuration, and visible material condition of equipment and components. During the walkdowns, the team assessed:

- The placement of protective barriers and systems,
- The susceptibility to flooding, fire, or environmental conditions,
- The physical separation of trains and the provisions for seismic concerns,

- Accessibility and lighting for any required operator action,
- The material condition and preservation of systems and equipment, and
- The conformance of the currently-installed system configuration to the design and licensing bases.

b. Findings

No findings of significance were identified.

.5 Design Review

a. Inspection Scope

The team reviewed the design of Units 1 and 2 service water systems. This review included an examination of design assumptions, calculations, environmental qualifications, required system thermal-hydraulic performance, electrical power system performance, control logic, and instrument set points and uncertainties. The related USAR sections, technical specifications, system drawings, various flow tests, summaries of inservice testing results, and condition reports related to the system were also reviewed. Various system analyses, including the net-positive suction head and submergence analyses, emergency cooling pond heat-up and inventory analyses, and the analysis to establish the performance testing acceptance criteria for the system heat exchangers were included in the review. The team also assessed the adequacy of calculations, analyses, test procedures, and operating procedures that licensee personnel used during normal and accident conditions.

b. Findings

(1) Failure to Incorporate Design Change into Design Basis and Technical Specifications

Introduction: The team identified that the licensee failed to effectively incorporate a design change into the design basis and associated emergency cooling pond technical specification surveillance requirements. The technical specifications for both units require annual soundings of the emergency cooling pond to verify adequate contained water volume corresponding to the required minimum level. The actual emergency cooling pond volume had been reduced by a 1978 design change that added rip-rap material to repair damage from wave action and erosion. However, the surveillance testing and supporting analyses did not reflect this change. As a result, the minimum emergency cooling pond level required by technical specifications did not correspond to the contained volume assumed in design analyses.

Description: The emergency cooling pond was designed to provide a shared heat sink for Units 1 and 2 safety-related components if the normal heat sink provided by the Dardanelle Reservoir became unavailable. Calculation 91-E-0099-10, "Emergency Cooling Pond Peak Temperature and Inventory Loss Analysis Summary," Revision 4, evaluated the capability of the emergency cooling pond to provide adequate cooling to both units for 30 days under design basis conditions. The calculation assumed an initial

emergency cooling pond water level of 5 feet, which was consistent with Unit 1, Technical Specification 3.7.8, and Unit 2 ,Technical Specification 3.7.4.1. The calculation also credited the emergency cooling pond level being increased to 5 feet - 4.5 inches by operator actions prior to the Dardanelle Reservoir being lost (also addressed in both units' technical specification bases). This calculation, as well as both units' technical specifications, stated that an indicated emergency cooling pond level of 5 feet corresponded to a contained water volume of 70 acre-feet. Both units' technical specifications included similar surveillance requirements to verify the contained water volume by performing soundings of the emergency cooling pond with a 12 month frequency.

The team questioned the correlation between an indicated level of 5 feet and a contained emergency cooling pond volume of 70 acre-feet. In response, the licensee provided Bechtel Calculation 4.1.2, "Emergency Cooling Reservoir," Revision 1 (August 17, 1978), which verified the required pond volume based on design drawings.

The team also questioned the adequacy of the annual emergency cooling pond sounding methodology. In accordance with Procedure 1306.019, Revision 007-05-0, emergency cooling pond soundings were taken at 50 foot intervals across the pond at various locations. The first sounding locations were 50 feet from monuments located near the shore. The results were then averaged to verify an "equivalent average depth" of at least 5 feet. The team determined that the depth near the shore was not being adequately verified. In addition, the sounding acceptance criteria did not verify the capacity of the emergency cooling pond to contain a level of 5 feet - 4.5 inches, as credited in Calculation 91-E-0099-10.

In response to the team's concerns, the engineering personnel performed a visual inspection of the emergency cooling pond embankment on June 23, 2005, and determined that rip-rap had been placed along the entire interior perimeter of the pond, and that the slope of the embankment deviated from the expected value. This configuration did not agree with the design drawings that were used to verify the emergency cooling pond volume in Bechtel Calculation 4.1.2. Condition Report CR-ANO-C-2005-01206 was initiated on June 23, 2005, to address this emergency cooling pond inventory reduction that had not been evaluated. The licensee performed additional investigation and determined that the rip-rap had been added in 1978 under Design Change Request 644, and that neither the applicable design drawings nor the emergency cooling pond volume calculation had been revised to reflect the emergency cooling pond inventory reduction. This condition report included an engineering evaluation for "operability-judgement," which established a minimum emergency cooling pond level of 5.33 feet to ensure adequate volume and continued operability. The licensee established this level as an administrative requirement pending further evaluations that were to be based on subsequent measurements of actual pond conditions.

The licensee also initiated a Condition Report (CR-ANO-C-2005-01096) on June 8, 2005, to address silt buildup in an area of the emergency cooling pond not measured by the soundings. Additionally, Condition Report CR-ANO-C-2005-01184 was initiated on June 22, 2005, to address the acceptance criteria of Sounding Procedure 1306.019, "Annual Emergency Cooling Pond Sounding," Revision 007-05-0.

Analysis: The team determined that failing to effectively incorporate the design change into the design basis and modify the associated emergency cooling pond technical specification surveillance requirements was a performance deficiency. The Mitigating Systems cornerstone was affected because the emergency cooling pond capacity was degraded because of reduced volume. The inspectors considered this finding to be more than minor since the finding fit with Example 3.I of Appendix E of Manual Chapter 612. The engineering staff had to perform reanalyses and operability evaluations because of this condition and the minimum required emergency cooling pond level had to be increased to ensure operability.

The team assessed this finding as Green because it did not represent an actual loss-of-the emergency cooling pond safety function since the specific accident conditions that could have challenged the emergency cooling pond have not existed. The licensee has determined the emergency cooling pond remained operable based on its actual level and has implemented appropriate corrective actions to ensure continued operability.

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, states, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. These measures shall include provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled. Measures shall also be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems and components. Contrary to this, the licensee failed to include the design change that added rip-rap into the design of the emergency cooling pond volume and in the associated emergency cooling pond technical specification surveillance requirements. Because this violation is of very low safety significance and has been entered into the licensee's corrective action program as Condition Report CR-ANO-C-2005-01206. This violation is being treated as a noncited violation consistent with Section VI.A of the NRC Enforcement Policy (NCV 05000313;368/2005008-03).

(2) Potential Design Vulnerability of Service Water System Strainers

Introduction. The team identified a Green finding, in that, the licensee had failed to fully address a vulnerability in the design of Units 1 and 2 service water system strainers.

Description. Both the Unit 1 and 2 service water systems were provided with full flow strainers downstream of each of the three service water pumps. This design did not include any provisions for bypassing or cleaning the strainers while in service, should they become clogged during system operation. At least one service water pump was normally in service for each unit. The strainer differential pressure was monitored by operations personnel, and the associated service water pump would be taken out of service when the strainer cleaning was required. During normal plant operation, with the service water loops cross-connected, cleaning a single strainer could be accomplished without any disruption of service water flow to components.

The team reviewed whether this design made the service water system vulnerable to strainer clogging under post accident conditions. Unit 1, Technical Specification 3.7.7, and Unit 2, Technical Specification 3/4.7.3, each require two operable service water pumps to provide flow to two service water loops. This would allow one of the three pumps to be out of service. The team questioned whether having only one service water pump available under post accident conditions because of a single active failure of the other pump had been adequately considered. If the inservice strainer were to become clogged during the 30-day service water system mission, the availability and reliability of this mitigating system could be adversely affected.

The service water system strainer design was part of the original plant design. The Unit 1 Safety Analysis Report appeared to be silent on the subject of service water strainer clogging, while the Unit 2 Safety Analysis Report (Table 9.2-5, Service Water System Single Failure Analysis) indicated that clogging of one service water strainer was considered to be a single failure. Table 9.2-5 stated that, "The other train will supply 100 percent of minimum requirements under all operating conditions, and the standby pump and strainer may be brought into service to provide an additional 100 percent of minimum requirements under all operating conditions." The Unit 2 Safety Analysis Report did not address the potential that one or both operating strainers could be clogged as a consequence of debris from the lake.

The team reviewed Condition Report CR-ANO-2-2004-01033, dated June 12, 2004, which addressed partial strainer clogging due to an influx of mayfly casings. During this event, all three Unit 2 service water strainers experienced an increase in strainer differential pressure due to a common cause. This condition report recommended actions to reduce the vulnerability of Unit 2 to these types of events. The associated corrective actions had been closed based on a proposed project (ER-ANO-2005-0148-000), which was considered an enhancement and not a required corrective action.

The team noted that the licensee had taken some actions to mitigate this concern. Operating procedures had been revised to cycle the service water pumps to clear a clogged strainer. In addition, a strainer "cage" had been added to the Unit 1 intake structure to minimize potential clogging of the Unit 1 strainers. However, the proposed modification to add screens to Unit 2 had not been implemented at the time of the inspection. The team concluded that this vulnerability had not been fully addressed.

Analysis. The inspectors determined this design vulnerability to be a performance deficiency since the susceptibility of the service water system strainers to a common mode clogging event had not been fully addressed. While the licensee does not consider clogging of all strainers a potential common failure mode, the definitions in Appendix A to Part 50 - General Design Criteria for Nuclear Power Plants indicate that it should be. Specifically, multiple failures resulting from a single occurrence are considered to be a single failure. Resolution of this issue was being treated as an enhancement and was not being tracked as a required corrective action. This issue was more than minor because it was associated with the Mitigating System cornerstone in that it could affect the availability, reliability, and capability of the service water systems. The issue screened as very low safety significance in Phase I of the significance determination process, because it was not found to result in a loss of system function.

Specifically, the team did not identify any instances where clogging of the strainers had resulted in inoperability of the service water system.

Enforcement. This design condition was not found to be contrary to any regulatory requirements or the licensing basis, therefore, this performance deficiency was not considered to be a violation of regulatory requirements (FIN 05000313;368/2005008-04).

.6 Safety System Inspection and Testing

a. Inspection Scope

The team reviewed the program and procedures for testing and inspecting selected components for the selected systems and support systems. The review included the results of surveillance tests required by the technical specifications and a selective review of inservice tests.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES (OA)

4OA6 Management Meetings

Exit Meeting Summary

The inspection findings were presented by the team leader during an exit meeting on June 24, 2005, to Mr. J. Forbes and other members of licensee management staff. The team leader confirmed that proprietary information, while reviewed, had not been retained by the team.

ATTACHMENT 1

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

M. Bhatti, Design Engineer
E. Blackard, Supervisor, Design Engineering
B. Buser, Electrical Design Engineer
K. Canitz, Unit 1 Operations Representative
C. Chadbourn, Supervisor, Design Engineering
S. Chandler, System Engineer
B. Daiber, Supervisor, System Engineering
J. Forbes, Vice President, Arkansas Nuclear One
D. Fouts, Safety Analysis
J. Eichenberger, Manager, Corrective Actions and Assessments
C. Eubanks, General Manager, Plant Operations
M. Ginsberg, Supervisor, Engineering Programs
J. Hale, Design Engineer
I. Jacobson, Engineering Programs
D. James, Acting Director, Nuclear Safety Assurance
P. Kearney, Maintenance Representative
J. Kowalewski, Director, Engineering
K. Nichols, Manager, Design Engineering
D. Macphee, Mechanical Design Engineer
J. Miller, Manager, System Engineering
D. Moore, Superintendent, Radiation Protection
R. Pierce, Unit 2 Operations Representative
J. Richardson, Mechanical Design Engineer
B. Rowlett, System Engineer
R. Scheide, Licensing Specialist
B. Short, Licensing Specialist
D. Williams, Safety Analysis
P. Williams, System Engineer

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000313;368/2005008-01	NCV	Inadequate Corrective Action to Include Valve In Testing Program (Section R21)
05000313;368/2005008-02	NCV	Inadequate Corrective Action to Repair Damaged Structure (Section R21)

05000313;368/2005008-03	NCV	Failure to Incorporate Design Change into Design Basis and Technical Specifications (Section R21)

Opened

05000313;368/2005008-04	FIN	Potential Design Vulnerability of Service Water System Strainers (Section R21)
05000313;368/2005008-05	URI	Essential Cooling Pond Dam Operability Evaluation (Attachment 2)

LIST OF DOCUMENTS REVIEWED

The following documents were selected and reviewed by the inspectors to accomplish the objectives and scope of the inspection and to support any findings:

Procedures

Number	Title	Revision
1000.006	Procedure Control	054-00-0
1203.025	Natural Emergencies	019-08-0
1203.030	Loss of Service Water	013-00-0
1608.007	Eradication of Fish and Algae Monitoring at the Emergency Cooling Pond	001-00-0
2104.029	Service Water System Operations	055-03-0
2203.022	Loss of Service Water	008-05-0
1104.029	Service Water and Auxiliary Cooling System	057-00-0
1203.012I,	Annunciator K10 Corrective Action	040-06-0
1203.025	Natural Emergencies	019-08-0
1203.030	Loss of Service Water	013-00-0
1306.019	Annual Emergency Cooling Pond Sounding	007-05-0
1309.013	Unit One Service Water Flow Test	011-00-0
1309.014	Service Water Piping Thickness Evaluation	3

1411.084	Unit 1 Sluice Gate and SW Bay Cleaning and Inspection	007-04-0
1608.007	Eradication of Fish from the Emergency Cooling Pond	001-00-0
2104.029	Service Water System Operations	054-06-0
1104.029	Service Water and Auxiliary Cooling System	057-00-0
2104.030	Auxiliary Cooling Water System Operations	006-05-0
2104.036	Emergency Diesel Generator Operations	049-01-0
2203.012F	Annunciator 2K06 Corrective Action	028-06-0
2203.012L	Annunciator 2K12 Corrective Action	032-03-0
2203.022	Loss of Service Water	008-05-0
2305.019	Service Water Pumps Flow Test	006-05-0
2311.002	Service Water System Flow Test	014-02-0
2411.102	Unit 2 Sluice Gate and SW Bay Cleaning and Inspection	004-03-0
EN-LI-102	Corrective Action Process	1

Condition Reports

CR-ANO-1-90-0735
CR-ANO-2-94-0487
CR-ANO-C-1997-00308
CR-ANO-1-1998-00592
CR-ANO-1-2002-00647
CR-ANO-1-2002-00655
CR-ANO-1-2002-00713
CR-ANO-1-2002-01139
CR-ANO-1-2002-01251
CR-ANO-2-2002-01381
CR-ANO-2-2002-01554
CR-ANO-1-2002-01558
CR-ANO-2-2002-01743
CR-ANO-C-2003-00301
CR-ANO-2-2003-01339
CR-ANO-2-2003-01561
CR-ANO-2-2004-00158
CR-ANO-1-2004-00333
CR-ANO-1-2004-00757
CR-ANO-2-2004-00918
CR-ANO-1-2004-00964
CR-ANO-2-2004-01033
CR-ANO-1-2004-01110
CR-ANO-2-2004-01200
CR-ANO-2-2004-01408
CR-ANO-2-2004-01539
CR-ANO-2-2004-01589
CR-ANO-1-2004-01595
CR-ANO-C-2004-01622
CD-ANO-C-2004-01921
CR-ANO-1-2004-02328
CR-ANO-1-2005-00028
CR-ANO-2 2005-00185
CR-ANO-1-2005-00202
CR-ANO-2-2005-00341
CR-ANO-2-2005-00374
CR-ANO-2-2005-00396
CR-ANO-2-2005-00560
CR-ANO-1-2005-00617
CR-ANO-C-2005-00651
CR-ANO-2-2005-00745
CR-ANO-2-2005-00771
CR-ANO-C-2005-00782
CR-ANO-2-2005-00994
CR-ANO-C-2005-01037
CR-ANO-2-2005-01099
CR-ANO-2-2005-01667
CR-ANO-2-2005-01800
CR-ANO-C-2005-01802
CR-ANO-2-2005-01810
CR-ANO-2-2005-01808

Drawings

Number	Title	Revision
E-2008, Sh. 1	Single Line Meter & Relay Diagram 480 Volt Load Centers Engineered Safety Features & Main Supply	27
E-2014, Sh. 4	Single Line Diagram 480 Volt Motor Control Centers 2B54	45
E-2015, Sh. 2	Single Line Diagram 480 Volt Motor Control Centers 2B62	36
E-2015, Sh. 4	Single Line Diagram 480 Volt Motor Control Center 2B64	42
E-2075, Sh. 2	Schematic Diagram Service Water Pump 2P4C	20
E-2076	Schematic Diagram Typical Circuit Breaker 6900 V and 4160 V Switchgear	13
E-2076, Sh. 1	Schematic Diagram Typical Circuit Breaker 6900 V and 4160 V Switchgear	14
E-2077, Sh. 2	Schematic Diagram Typical Internal Wiring Diagram 4160V Motor Protection	9
A-2103, Sh. 1	Architectural Floor Plan at El. 368'-0"; 372'-0 & 374'-6	34
A-2522, Sh. 2	Architectural Door Details	15
C-2026	Yard Underground Utilities	23
C-2026A Sh. 18 of 41	Underground Utilities	0
M-115	Drainage - Auxiliary Building Area No. 6 Plan at El. 354'-0" & 369'-0"	10
M-116	Drainage - Auxiliary Building Area No. 4 Plan at El. 369'-0" & 372'-0"	15
M-204, Sh. 3	Piping & Instrument Diagram - Emergency Feedwater	30
M-209, Sh. 1	Piping & Instrument Diagram - Circ. Water, Service Water & Fire Water Intake Structure Equipment	105
M-209, Sh. 2	Piping & Instrument Diagram - Condenser Vacuum, Circ. Water & Discharge Structure Equipment	40
M-210, Sh. 1	Piping & Instrument Diagram - Service Water	140
M-211, Sh. 1	Piping & Instrument Diagram - Auxiliary Cooling Water	84

M-2065	Plant Design Drawings - Area 26 Containment Aux. Building Misc. Plans & Sections	12
M-2110	Plumbing & Drainage - Auxiliary Building Area No. 24 Plan at El. 354'-0"	27
M-2115	Plumbing & Drainage - Auxiliary Building Area No. 26 Plan at El. 354'-0"; 369'-0" & 374'-6"	15
M-2116	Plumbing & Drainage - Auxiliary Building Area No. 24 Plan at El. 369'-0"; 372'-0" & 374'-6"	25
M-2204 , Sh. 1	Piping & Instrument Diagram - Condensate and Feedwater	96
M-2209, Sh. 1	Piping & Instrument Diagram - Circulating Water Systems	115
M-2210, Sh. 1	Piping & Instrument Diagram - Service Water System	84
M-2210, Sh. 2	Piping & Instrument Diagram - Service Water System	80
M-2210, Sh. 3	Piping & Instrument Diagram - Service Water System	86
M-2210, Sh. 6	Piping & Instrument Diagram - Service Water System Booster Pumps	0
M-2211, Sh. 1	Piping & Instrument Diagram - Auxiliary Cooling Water	65
M-2236, Sh. 1	Piping & Instrument Diagram - Containment Spray System	91
M-2406, Sh. 6	Functional Description and Logic Diagram - Service Water and Auxiliary Cooling Water Systems	5

Calculations

Number	Title	Revision
2-4720-1	Pump 2P4A, B, & C , SWS	0
4.1.2	Emergency Cooling Reservoir	1
82-D-2086-01	Volume of CST T-41B Requiring Tornado Missile Protection	3
83D-2181-01	Corridor 2104 - Maximum Depth of Ponding after Drainage Upgrade	3
83E-0063-02	North Diesel Generator Room Elev. 368' 2094-Q Ponding Evaluation	0
88E-0032-01	ANO Unit 2 DBA with 1 SP & 1,2 AC with Deg. SDHX	0
88-E-0032-12	LOCA Containment Analysis for ANO-2 SGR and Power Uprate	0

88-E-0044-02	ANO-1 SW Pump NPSH and Submergence Requirements	0
88-E-0074-01	ANO-1 EDG Cooling Requirements	2
88-E-0098-20	ANO-1 DBA Reanalysis	1
91-D-2003-01	Unit 2 EDG Load Capacity Calculation	5
91-E-0099-10	Emergency Cooling Pond Peak Temperature and Inventory Loss Analysis Summary	4
91-R-2013-01	Service Water Performance Testing Methodology	13
94-SQ-2001-00	U-2 SQUG SEWS and OSVS for Equipment Class 0	0
95-R-0014-01	Unit 1 Decay Heat Cooler Heat Exchanger Test Protocol	3
95-R-0014-02	Unit 2 Shutdown Cooler Heat Exchanger Test Protocol	3
991457E205-01	Effects of 4000 gpm SW flow to 2E35A and 2E35B on DBA Analysis	0
ER 991457 E205	Qualification of 4000 gpm Flow to 2E35A and 2E35B	0
ER991916 E101	ANO-1 DH Cooler Minimum SW Flow	0
ER-ANO-2002-0477-000	Provide Service Water Containment Building Isolation Valve Throttling Justification	0
ER-ANO-2002-0477-001	Provide Service Water Containment Building Isolation Valve Throttling Justification (Revision to ER-ANO-2002-0477-000)	0
ER-ANO-2002-0960-000	Review of 2002 / Cycle 16 Thermal Performance Testing of U2 EDGs	0
ER-ANO-2003-0737-003	Evaluate the Capacity of the ANO-2 EDG Heat Exchangers to Meet Load Profile Requirements with Reduced SW Flow	0
ER-ANO-2003-0737-005	Correct 50.59 for ER-ANO-2003-0737-003 and Obtain Corresponding ER Approvals	0
84-E-0102-14	BKR 152/402	2
84-E-0103-27	BKR 52/522	1

Engineering Requests

Number	Title	Revision
003293-E301	Service Water Excessive Flow Evaluation for ANO-1 and ANO-2	0

Technical Specifications

Section	Title	Revision
Unit 1 3.7.7	Service Water System	Amendment 215
Unit 1 3.7.8	Emergency Cooling Pond	Amendment 215
Unit 2 3/4.7.3	Service Water System	
Unit 2 3/4.7.4	Emergency Cooling Pond	Amendment 153

Final Safety Analysis Reports

Section	Title	Revision
Unit 1 Table 6-10	Single Failure Analysis - Reactor Building Cooling System	Amendment No. 19
Unit 1, 9.3	Cooling Water Systems	Amendment No. 17
Unit 2, 3.6.4.3.3.3	Emergency Diesel Generator Rooms	Amendment No. 18
Unit 2, 9.2.1	Service Water System	Amendment No. 18

Letters & Memoranda

March 3, 2005. D.E, James to USNRC, 90-day Response to Generic Letter 2004-02 (Letter 0CAN030501.)

June 20, 1988. LIC-068-27, Pipe Rupture Leakage Criteria.

March 30, 1995. A. Bill Beach, NRC Director of Division of Reactor Projects. NRC Inspection Report 50-313/94-10; 50-369/94-10.

Miscellaneous

Number	Title	Revision
TD G080.0060	Instructions GEI-44233 F Time-Overcurrent Relays Type IAC66K	1

ER-ANO-1998-0738-002	Emergency Cooling Pond Remote Level Indication	0
ER-ANO-2001-0451-001	Modification of SW Return Piping Downstream of SW-8B	0
NC-973806N101	Service Water Bay Strainers	0
TAP No. 05-2-005	Adjustment of 2CV-5650-2 Open Travel Limit to a Position Less Than 100%, dated March 26, 2005	
IRF No. 6743	Support of DCP 93-1002 and MOV Program, dated June 2, 1993	
CEP-IST-1	IST Basis Document	3
STM 1-42	Unit 1 System Training Manual - Service & Auxiliary Cooling Water	9
STM 2-42	Unit 2 System Training Manual - Service Water & Auxiliary Cooling Water Systems	20
ULD-0-TOP-03	Seismic Topical	1
ULD-0-TOP-07	HELB/MELB Topical	2
ULD-0-TOP-17	Flooding Topical	0
ULD-1-SYS-10	ANO Unit 1 Service Water System	11
ULD-2-SYS-10	ANO Unit 2 Service Water System	9
	ANO Unit 1 Service Water Performance Criteria Basis	
	ANO Unit 2 Service Water Performance Criteria Basis	
	ANO Unit 1 Service Water Train A Availability & Reliability Data	
	ANO Unit 2 Service Water Train A Availability & Reliability Data	
	ANO Unit 1 Service Water Maintenance Rule Data Base	
	ANO Unit 2 Service Water Maintenance Rule Data Base	
	Temporary Alteration Log Index Sheets – Service Water	
Proc./Work Plan No. 2104.005	Containment Spray	042-02-0