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ARKANSAS NUCLEAR ONE

TITLE: OVERHEATING	PROC/WORK PLAN NO. 1202.004	REV. 3
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CONTROLLED COPY # 62	PAGE 1 OF 1	IPTE ☐YES ☒NO

PAGE	REV	CHG	PAGE	REV	CHG	PAGE	REV	CHG	PAGE	REV	CHG
1	3		18	3	PC-2						
2	3		19	3	PC-2						
3	3	PC-2	20	3	PC-2						
4	3	PC-2	21	3							
5	3	PC-1	22	3	PC-2						
6	3	PC-1	23	3							
7	3	PC-1									
8	3										
9	3										
10	3										
11	3	PC-2									
12	3	PC-2									
13	3										
14	3										
15	3										
16	3										
17	3										

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LIST OF AFFECTED PAGES	1000.006A	41

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ENTERGY OPERATIONS INCORPORATED
ARKANSAS NUCLEAR ONE

TITLE: OVERHEATING	PROC/WORKPLAN NO. 1202.004	REV. 3PC2	DATE: 6/27/95

AFFECTED PAGE NUMBERS: 23	AFFECTED UNIT: ☒1 ☐2

DESCRIPTION OF ENHANCEMENT:

Correct referenced step in Floating Step associated with Tube-to-Shell ΔT. Changed "...perform step 4.E" to "...perform step 4.D".

The following conditions must exist to process an enhancement:

1. The enhancement does not constitute an intent change and doesn't change the 1000.006A Form.
2. A 50.59 review is not required per step 6.3.2 of 1000.131.
3. The enhancements requested fall entirely into one or more of the following categories:
   a. The enhancement is editorial (i.e. misspelling, misnumbering or transposition of data)
   b. The enhancement is the result of a change to a title, step number, attachment number, etc., of another document that is referred to in this document.
   c. The enhancement is the result of approved individual or organizational title changes.
   d. The enhancement is the result of an approved configuration management change, (i.e. DCP, LCP, PC or Temporary Modification) and affects only component name/number or annunciator title/location.
   e. The enhancement results in the addition of references in the reference section.
   f. The enhancement is limited to the description, discussion, purpose or scope sections only.
   g. The enhancement results in the cosmetic improvement of page layout, drawings or other graphics with no change in content.
4. The originator of any revision/change currently checked out has been notified of the enhancement.

Verification that the above conditions have been met: E Jack / 6/27/95
Originator Date

APPROVAL (SECTION LEADER): Joe Clement	DATE: 6-27-95	CONCURRENCE (PSC CHAIRMAN): [signature]	DATE: 6/27/95

FORM TITLE: PROCEDURE ENHANCEMENT REQUEST	FORM NO. 1000.006EZ	REV. 43 PC-1

Entry Conditions

NOTE

Throughou. this procedure, harsh containment values in brackets [] shall be used, where provided, if either of the following criteria are met:

- Average RB Temp >200°F
- RB Radiation Level >10^5 R/hr

- RCS temp rising above either:

  580°F T-hot with any RCP on
  <u>OR</u>
  610°F CET temp with all RCPs off, following a Reactor trip.

- CET temp rising above 610°F
  <u>AND</u>
  all MFW and EFW is lost during loss of adequate SCM.

- Loss of all feedwater (MFW and EFW) following a Reactor trip.

INSTRUCTIONS

1. IF any of the following criteria is met before overheating is corrected, THEN GO TO step 4.
   - ERV opens in AUTO
   - RCS press ≥2450 psig
   - RCS press approaches NDTT Limit (Figure 3)
2. Reduce running RCPs to one per loop.
3. Verify proper EFW actuation and control (RT 5).

(3. CONTINUED ON NEXT PAGE)

CONTINGENCY ACTIONS

3. IF EFW fails to actuate, THEN perform the following:

   A. Place EFW CNTRL valves in HAND AND close:

SG A		SG B
CV-2645	P7A	CV-2647
CV-2646	P7B	CV-2648

   B. Place EFW Pump Turbine (K3) Steam Admission valves in MANUAL AND close (CV-2613 and 2663).

   C. Dispatch an operator to restore EFW using Emergency Feedwater Pump Operation (1106.006).

   D. IF MFW pump(s) is available

   AND

   EFIC SG level is >20" [35"] OR is still dropping, THEN perform the following:

   1) Verify MFW pump(s) maintaining ≥70 psid across Startup valves.

   2) IF only one MFW pump is operating, THEN verify Feedwater pumps DISCH Crosstie open (CV-2827).

   3) IF any RCP is operating, THEN verify Startup valves operate to maintain SG levels 20 to 40"

INSTRUCTIONS

3. (Continued).

PC-2

(3. CONTINUED ON NEXT PAGE)

CONTINGENCY ACTIONS

4) IF all RCPs are off, THEN operate Startup valves in HAND to raise EFIC SG levels as quickly as possible to one of the following:

SCM adequate	300 to 340"
SCM < adequate	370 to 410"

5) IF primary to secondary heat transfer is established, THEN verify TURB BYP or ATM Dump Control System operates to stabilize CET temp.

E. IF AUX Feedwater pump (P75) is available

AND

EFIC SG level is >20" [35"] OR is still dropping, THEN perform the following:

1) Verify at least one Condensate pump running.

2) Verify Feedwater pumps DISCH Crosstie open (CV-2827).

3) Place Startup valves in HAND AND close.

4) Verify Main and Low Load Block valves shut.

5) Start P75.

INSTRUCTIONS

3. (Continued).

CONTINGENCY ACTIONS

6) IF any RCP is operating, THEN throttle open Startup valves to raise SG levels to ≥20".

a) WHEN EFIC SG level is ≥20", THEN place Startup valve in AUTO

AND

verify valve operates to maintain SG level 20 to 40"

7) IF all RCPs are off, THEN operate Startup valves in HAND to raise SG levels as quickly as possible to one of the following, without causing pump runout:

SCM adequate	300 to 340"
SCM < adequate	370 to 410"

8) IF primary to secondary heat transfer is established, THEN verify TURB BYP or ATM Dump Control System operates to stabilize CET temp.

F. IF MFW AND AUX Feedwater pumps are not available, THEN close Main Feedwater Isolation valves to prevent feeding with Condensate pump as SG boils dry (CV-2630 and 2680).

PC-2

CHRONOLOGICAL FILE

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

August 24, 1988

Docket No. 50-313

Mr. T. Gene Campbell
Vice President, Nuclear
Operations
Arkansas Power and Light Company
P. O. Box 551
Little Rock, Arkansas 72203

AUG 2 - 1988
ARKANSAS POWER & LIGHT CO.
Nuclear Operations

Dear Mr. Campbell:

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 (ANO-1) - RESOLUTION OF GENERIC ISSUE (GI) 124 - AUXILIARY FEEDWATER SYSTEM RELIABILITY (TAC NO. 68188)

An auxiliary feedwater (AFW) system review has been conducted to assess the overall reliability for each of seven plants with a two train AFW system under GI-124, Auxiliary Feedwater System Reliability. This effort includes a plant-specific review and an on-site audit of the AFW system, and calculated estimates of the reliability of the AFW system given various initiating events. The staff utilized this approach to resolve GI-124 rather than a strictly analytical approach because it believed that a first-hand audit of the AFW system design and operation more directly addressed the root causes of AFW system unavailability and unreliability.

In general, the resolution approach adopted by the staff relied on an audit of several parameters that affect the availability and reliability of the AFW system. These parameters include design configurations; maintenance, surveillance, and testing procedures and practices; operating procedures; personnel training; system layout; operating experience; instrumentation and control; and environment and accessibility for operator recovery actions following potential malfunctions. The Standard Review Plan (SRP) Section 10.4.9 AFW system numerical reliability criterion (10^{-4} to 10^{-5} per demand) served as the basis for concluding that the AFW system in the seven plants of concern was acceptably reliable. Because the SRP criterion specifies consideration of compensating factors such as other reliable decay heat removal methods to justify a larger AFW system unavailability, the staff evaluated compensatory features as part of its effort.

A detailed review of maintenance, procedures and training was not conducted for ANO-1 since licensee programs and practices in these areas are the same as those for ANO-2 which was previously evaluated in detail for GI-124 resolution. The licensee satisfactorily addressed the issues in these areas during the ANO-2 GI-124 review. Further, a detailed review of AFW instrumentation and control was not conducted because of past staff reviews of the emergency feedwater initiation and control system at Crystal River and Rancho Seco which are very similar to that at ANO-1.

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Based on its review, the staff concludes that the ANO-1 AFW system, in conjunction with the startup feedwater pump as a compensatory decay heat removal feature, provides sufficient reliability to meet the unavailability criterion of SRP Section 10.4.9 for the more frequently occurring transients such as loss of main feedwater, and therefore, this issue is considered resolved for ANO-1. The report documenting the staff review under GI-124 is enclosed for your information.

Sincerely,

CCHarbuck

C. Craig Harbuck, Project Manager
Project Directorate - IV
Division of Reactor Projects - III,
IV, V and Special Projects

Enclosure:
As stated

cc w/enclosure:
See next page

Mr. T. Gene Campbell
Arkansas Power & Light Company

Arkansas Nuclear One, Unit 1

cc:

Mr. Dan R. Howard, Manager
Licensing
Arkansas Nuclear One
P. O. Box 608
Russellville, Arkansas 72801

Mr. James M. Levine, Executive Director
Nuclear Operations
Arkansas Nuclear One
P. O. Box 608
Russellville, Arkansas 72801

Mr. Nicholas S. Reynolds
Bishop, Cook, Purcell & Reynolds
1400 L Street, N.W.
Washington, D.C. 20005-3502

Mr. Robert B. Borsum
Babcock & Wilcox
Nuclear Power Generation Division
1700 Rockville Pike, Suite 525
Rockville, Maryland 20852

Resident Inspector
U.S. Nuclear Regulatory Commission
1 Nuclear Plant Road
Russellville, Arkansas 72801

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
Office of Executive Director
for Operations
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

Mr. Frank Wilson, Director
Division of Environmental Health
Protection
Department of Health
Arkansas Department of Health
4815 West Markham Street
Little Rock, Arkansas 72201

Honorable William Abernathy
County Judge of Pope County
Pope County Courthouse
Russellville, Arkansas 72801

ARKANSAS NUCLEAR ONE, UNIT - 1 AUXILIARY FEEDWATER
SYSTEM RELIABILITY ASSESSMENT

A. Summary and Conclusions

This report contains the staff's assessment of the overall reliability of the auxiliary feedwater system (AFWS) for Arkansas Nuclear One, Unit 1 (ANO-1). This review was performed in connection with resolution of Generic Issue (GI) 124, "Auxiliary Feedwater System Reliability," which addresses AFWS reliability in certain plants.

AFWS reliability analyses indicated that many plants fell in the high reliability range as defined by the staff in the Standard Review Plan, however, several plants fell in the lower reliability range. While these plants met applicable licensing requirements for the AFWS, their system reliability was still in question. Some licensees for this latter group of plants implemented modifications to increase AFWS reliability to an acceptable range. However, AFWS reliability for seven plants remained questionable. The plants in this category are ANO-1 and 2, Crystal River, Ft. Calhoun, Prairie Island Units 1 and 2, and Rancho Seco. The objective of the review under GI-124 is to evaluate the AFWS reliability for these seven plants and to document any recommendations for further licensee actions.

The resolution approach adopted by the staff in its review of ANO-1 relied on an audit of several plant features that affect the availability and reliability of the AFW system in addition to an assessment of numerical unavailability. These variables include design configurations; maintenance, surveillance and testing procedures and practices; operating procedures; personnel training; operating experience; instrumentation and control; and environment and accessibility for operator recovery actions following potential malfunctions. The AFWS numerical reliability criterion (10^{-4} to 10^{-5} per demand) given in Section 10.4.9 of the Standard Review Plan (SRP) served as the basis for evaluating the AFWS in the seven plants of concern. The SRP criterion specifically states: "An acceptable AFWS should have an unavailability in the range of 10^{-4} to 10^{-5} per demand based on an analysis using methods and data presented in NUREG-0611 and NUREG-0635. Compensating factors such as other methods of accomplishing the safety functions of the AFWS or other reliable methods for cooling the reactor core during abnormal conditions may be considered to justify a larger unavailability of the AFWS." For the plants under consideration in GI-124, the focus of the concern for adequate AFWS reliability was on the more frequently occurring challenges to the the system such as loss of main feedwater. Further, because the SRP criterion specifies consideration of compensating factors such as the availability of other reliable decay heat removal methods to justify a larger AFWS unavailability, an evaluation of compensatory features was also conducted.

When determining whether or not to give credit for compensatory decay heat removal features, the staff position has been and continues to be that only features which relate to secondary side decay heat removal capability (e.g. a startup feedwater pump, AFW pump discharge crossconnections between units, or a third AFW pump) can be considered acceptable for satisfying the SRP criterion. While the staff recognizes the capability to remove decay heat in the "feed-and-bleed" mode utilizing the primary system safety/relief valves and high pressure

injection pumps, such a method involves large uncertainties in operator response. Therefore, it is considered to be a suitable backup to the AFWS in emergency procedures as a last resort for decay heat removal, but is not sufficiently reliable to justify it as a compensatory feature in order to meet the SRP goal for AFWS reliability.

The staff did not undertake a detailed review of maintenance, operations (emergency procedures) and training at ANO-1. The licensee's practices in these areas for ANO-1 are essentially the same as those previously covered in the review of GI-124 for ANO-2. Because the outstanding issues in these areas were resolved as discussed in the GI-124 report for ANO-2, no further discussion is included in this report.

It should also be noted that a separate section is not included on instrumentation and control. This is because the emergency feedwater initiation and control (EFIC) system at ANO-1 is very similar to the same system provided at Crystal River and Rancho Seco which have already received extensive detailed staff review. EFIC is a fully safety-related system for automatic AFW system initiation and control and meets staff criteria under item II.E.1.2 of NUREG-0737.

The licensee indicated to the staff during discussions regarding resolution of GI-124 that substantial modifications and improvements have been made to the AFW system since 1980 (see Figure 3). These include provision for a back-up suction supply from the service water system, replacement of the AFW pump turbine driver and associated turbine control improvements, installation of the safety related emergency feedwater initiation and control (EFIC) system and associated OTSG instrumentation, installation of new AFW suction and discharge piping and valves, installation of safety related flow indication, and installation of the "Q" (safety-related) condensate storage tank. These improvements were made as part of the post-TMI upgrades to the system imposed by the staff under items II.E.1.1 and II.E.1.2 of NUREG-0737, Clarification of TIM Action Plant Requirements. Some of the modifications were not a result of specific NRC requirements but resulted from the licensee's recognition of the importance of reliable AFW capability. The staff concurs with the licensee that the modifications have improved AFW system reliability.

However, as discussed subsequently in this report, despite the above modifications, the licensee concluded that the auxiliary feedwater system numerical unavailability will not meet the explicit SRP criterion. Consequently, a review of compensating features for decay heat removal was performed. The licensee indicated that the startup feedwater pump provides an additional means to deliver water to the steam generators in the event of a loss of main and auxiliary (emergency) feedwater. Use of this pump is clearly discussed in plant emergency operating procedure No. 1202-01. The licensee also noted that the high head safety injection pumps provide a capability to remove sufficient decay heat in the "feed-and-bleed" mode. Based on staff review of the startup feedwater pump, the staff concludes that it serves as a sufficiently reliable compensatory decay heat removal feature and, when considered in conjunction with the AFW system, adequately reliable secondary side decay heat removal capability is demonstrated. Therefore, GI-124 is resolved for ANO-1. Additional discussion of the startup feedwater pump is provided in Section F. of this report.

The staff also finds that the AFW system design and operation adequately consider other staff generic concerns raised within GI-124 (i.e., GI-68 with respect to environmental qualifications of the motor driven AFW pump, GI-93 with respect to steam binding of the AFW pumps, GI-122.1.a,b, and c with respect to isolation valve failure, and interruption and recovery of AFW flow, GI-122.2 with respect to initiation of "feed-and-bleed," and GI-125.II.1.b with respect to single failure protection).

B. Introduction

This report discusses the staff's assessment of the Auxiliary Feedwater System (AFWS) reliability for Arkansas Nuclear One, Unit 1 (ANO-1). This review was done in connection with the resolution of of Generic Issue (GI) 124. GI-124, "Auxiliary Feedwater System Reliability," addresses the reliability of the AFWS in certain plants. Reliability analyses* for AFWSs indicated that many plants fell in the high reliability range as defined in the Standard Review Plan, NUREG-0800 However, several plants fell in the lower reliability ranges. Licensees for some of these plants implemented sufficient modifications to increase their AFWS reliability to an acceptable range. However, the reliability of the AFWS for seven plants, including ANO-1, remained questionable. The six other plants are ANO-2, Crystal River, Ft. Calhoun, Prairie Island, Units 1 and 2, and Rancho Seco.

The objective of this task is to determine whether the AFWS of each of the subject seven plants is sufficiently reliable and to document any recommendations for further licensee or staff actions.

This report presents the issue resolution approach and evaluation philosophy in Section C, and detailed evaluations in Sections D,E and F. The summary and conclusions are presented in Section A of this report.

C. Resolution Approach

The staff believes that a high degree of availability and reliability for the AFWS can only be achieved if such a system is adequately designed, properly maintained and well operated. Proper maintenance and operating practices help reduce component failures. These practices are enhanced by good training programs for the maintenance and operations personnel. Good training programs also help the operations personnel understand the system's capabilities and its importance to safety. System understanding reduces failure due to maloperation of equipment and improves the likelihood of recovery in case of unanticipated component failures.

As indicated previously, detailed reviews of maintenance, emergency procedures and training as they relate to the ANO-1 AFW system were not conducted as part

*NUREG-0611, and NUREG-0635, Generic Evaluation of Feedwater Transients and Small Break LOCAs in Westinghouse and CE Designed Plants, respectively, and NRC memoranda from A. Thadani to O. Parr dated October 17, 1983, October 23, 1983, and November 9, 1984.

of the specific review for ANO-1 because of the applicability of the plant practices and staff review in these areas previously completed under the GI-124 review for ANO-2. Thus, no discussion is provided in this report related to these aspects of the AFW system. Specific discussion is provided on the system design and configuration (Section D), system walkdown (Section E), and operating experience and reliability analysis (Section F).

The approach to resolution adopted by the staff as previously indicated is based on a deterministic assessment of the AFW system design, maintenance and operation in order to ensure its optimum availablity and performance. The system numerical unavailability is then compared against the SRP criterion (10^{-4} to 10^{-5} per demand), and consideration of appropriate reliable compensatory decay heat removal features is included as necessary. The specifics of this review are provided in subsequent sections of this report.

D. Design and Configuration

The staff conducted a review of the design and configuration of the ANO-1 AFW system. The staff met with the licensee to discuss the ANO-1 AFW system design and its compliance with the criteria of Standard Review Plan Section 10.4.9. A walk-down of the AFW system was also conducted by the staff to verify that the as-built configuration was in accordance with the design.

ANO-1 is a Babcock and Wilcox designed reactor, with two once-through steam generators, two MFW trains (each with a turbine-driven pump), and three motor-driven condensate pumps. In addition, a startup feedwater pump is provided for use during normal plant startup and shutdown. The reactor is located in a large dry reinforced concrete containment. The plant is provided with two 100% capacity diesel generators for power to shutdown cooling systems if offsite power is lost.

The ANO-1 AFW system is a two-train system (refer Figure 4 for a system design summary). One train contains a centrifugal pump driven by an electric motor (P7B) and the other train contains a steam turbine driven pump (P7A). Diversity in pump drivers eliminates common mode failures in the AFWS motive power. The AFW system configuration and turbine steam supply is shown in Figures land 2 respectively. The pumps, P7A and P7B, are identical. At rated flow, each pump is capable of providing a minimum of 720 gpm which is sufficient for removing decay heat loads in excess of 3 percent of rated thermal power. The plant is also equipped with a steam bypass system. Each of the plant's two steam lines is equipped with an atmospheric steam dump valve (ADV) upstream of the main steam isolation valve (MSIV). This arrangement makes the dump valves operable even if the MSIVs are closed. The electric motor driver is capable of being powered from the B emergency diesel generator. The valves in the turbine driven train to each OTSG are dc powered to ensure AFW flow in the event of a loss of all ac power.

The steam turbine driver for P7A is a single stage, solid wheel, non condensing, horizontal, split case Terry turbine unit. It is designed for variable speed operation and is equipped with an electrohydraulic actuator for speed control, an overspeed trip mechanism, and an integral trip throttle valve. It is also

designed for rapid starting and will operate with steam generator pressures ranging from 1,100 psia to 60 psia. An electronic speed control system with a ramp feature and step open feature on the steam admission valves are provided to reduce the possibility of overspeeding the turbine. The steam admission valves are located outside the AFW pump room, and therefore, the steam supply line is not normally pressurized thereby precluding the need for high energy line break protection. Steam can be supplied to the turbine driver from either or both steam headers. Steam traps are installed on the turbine steam supply lines to continuously remove any condensate. The turbine exhausts to the atmosphere. Cooling water for the turbine lube oil cooler is piped from the pump suction. Pump and motor bearings do not require auxiliary cooling.

The AFWS is not used for normal plant startup or shutdown, but is on standby for emergency conditions. Suction for the AFW pumps is provided by the seismic category I "Q" condensate storage tank through redundant locked open manual valves. A backup supply is also available from the nonseismic condensate storage tank through a locked closed manual valve and from each loop of the seismic Category I service water system through redundant normally closed motor operated valves. A minimum of 160,000 gallons of water in the "Q" CST is required to be available by technical specifications. In addition, the "Q" CST is provided with a tornado missile barrier wall which protects a minimum of 30 minutes of AFW supply to permit time for the operator to transfer manually to the service water backup in the event of CST failure in a tornado. A pump minimum flow recirculation line is provided with an orifice which returns to the CST for pump protection. In addition, a full flow recirculation test line to the CST is also provided. The valves in the test line are normally closed and close on receipt of an AFW initiation signal.

The AFWS discharge piping and valving arrangement is designed to allow either pump to supply water to either or both steam generators. The discharge line valves are normally open. Each line to each steam generator is provided with a dc powered solenoid operated flow control valve and an AC powered motor operated valve to ensure isolation of a faulted steam generator, and feed flow to the intact steam generator as required during emergency operation following a postulated main steam or feedwater line break. The valves are powered from redundant supplies thus ensuring flow in the event of a single failure. Backleakage of steam/hot water in the AFW lines is prevented by three check valves in series. The AFW discharge lines are also checked for high temperature each shift to ensure that unacceptable backleakage is not occurring and potential steam binding of the pumps is avoided.

Automatic initiation and control of AFWS is provided by the emergency feedwater initiation and control (EFIC) system (refer to Figures 5, 6 and 7). EFIC is a safety related control system which ensures initiation and continuous control of auxiliary feedwater flow to an intact steam generator in the event of loss of main feedwater, loss of reactor coolant pumps (loss of offsite power) or low level in an OTSG. EFIC also controls the steam exhaust path by modulating the atmospheric dump valves. The ANO-1 EFIC system is very similar to that provided at Crystal River and Rancho Seco. Details on the EFIC design are provided in the Crystal River GI-124 report, and the Rancho Seco restart safety evaluation, NUREG-1286.

In the event of a complete loss of the AFW system, other methods are available to remove decay heat, including (1) use of the startup feedwater pump, (2) condensate pumps and (3) "feed-and-bleed." Use of these alternate decay heat removal methods is addressed in the plant emergency procedure.

On the basis of this evaluation, the staff concludes that the AFW system at ANO-1 complies with the applicable criteria of Section 10.4.9 of the Standard Review Plan, including the guidelines of NUREG-0737, Item II.E.1.1. The staff notes that use of the startup feedwater pump, condensate pump, and "feed-and-bleed" capability are effective means of decay heat removal and enhance the plant's overall capability of decay heat removal. Use of the startup feedwater pump as a compensatory decay heat removal feature has been considered and is discussed further in this report.

E. System Walkdown

As part of the staff's review, a site visit and AFW system walkdown was conducted. The walkdown afforded the staff the opportunity to examine the as-built system configuration, specific components, and potential for undesirable system interactions. The system walkdown had two main objectives. One was to confirm that the installed system conformed to the staff's understanding of the system design basis as identified in previous evaluations, and to determine if the system may be subject to common mode failure mechanisms or hazards (e.g., flooding, fire, missiles, suction strainers, etc.). The other main objective was to examine the ease of operator access to equipment for performing potential recovery actions. This includes assessment of local emergency lighting, communications, and other factors (e.g., cleanliness, equipment labeling, use of locking devices, posting of simple instructions at equipment locations, etc).

The walkdown covered the piping and component layout from the condensate storage tanks, through the pumps to the containment penetration and included the turbine driven AFW pump steam supply lines, switchgear, and the instrumentation and control provided in the control room. Based on the walkdown, the staff identified no areas of concern regarding the as-built AFW system configuration, common mode failure potential, or ease of access for recovery actions.

F. Operating Experience and Reliability Analysis

As part of the staff review under GI-124 for ANO-1, the staff discussed AFW component failure history, feedwater transient experience and AFW system numerical reliability evaluation with the licensee.

Since 1984, only two AFW component failures have occurred, both in 1985 (refer to Figure 9). Prior to that time, five random component failures occurred in 1983 and six in 1981. Four of the six failures involved the turbine driven pump, but these were corrected with the installation of a new turbine driver in 1982. The recent experience indicates that the licensee programs for ensuring AFW component operability are effective as no failures have occurred since 1986.

A review of unanticipated reactor trip experience for ANO-1 since 1981 indicated a high of 8 per year in 1983 and 1985, but only two per year in 1986 and 1987, and one in the first six months of 1988 (refer to Figure 10). Further, with

the exception of 1985, an average of less than two trips per year relate to main feedwater system upsets. The six main feedwater upsets which occurred in 1985 are attributable to startup difficulties experienced with installation and tuning of the EFIC system. The licensee indicated their commitment to improve main feedwater system performance and reduce reactor trips as part of their efforts during implementation of the B&W Owners Group Safety Performance Improvement Program recommendations. The staff concludes that the most recent trip experience and continued licensee efforts have/will contribute to reduced challenges to the AFW system.

As was stated previously, the licensee indicated that a update of the reliability analysis for the current ANO-1 AFW system accounting for the recent modifications resulted in a numerical unavailability of $4X10^{-4}$ per demand for a loss of main feedwater using the NUREG-0611 data base and methodology as specified in the SRP criterion (refer to Figure 8). This value exceeds the acceptance criterion of 10^{-4} per demand and thus necessitated consideration of other compensatory decay heat removal features. To address compensatory features, the licensee pointed out that the existing Emergency Procedure 1202.01 section dealing with overheating identifies a hierarcy for decay heat removal capability following transients and accidents (refer to Figure 11). Included in this procedure as the first means following a loss of main feedwater is the startup feedwater pump. This pump provides full AFW flow at above the normal secondary side pressure when operated in series with a condensate pump. It serves as the normal means of plant startup and shutdown. This capability is available in addition to use of a condensate pump alone upon OTSG depressurization, use of a service water pump for service water addition to the OTSG upon depressurization, and "feed and bleed" cooling. "Feed and bleed" cooling requires only a single high pressure injection pump since it has the capability to lift the primary system safety valves.

Based on the above, the staff concludes that the startup feedwater pump serves as a suitably reliable compensatory feature for decay heat removal to justify a calculated AFW system unavailability lower than the SRP acceptance criterion, and therefore, the AFW system supplemented by the startup pump meets the SRP numerical reliability criterion for the more frequently occurring transients such as loss of main feedwater. The staff, therefore, considers GI-124 resolved for ANO-1.