Tennessee Valley Authority, Post Office 2000, Spring City, Tennessee 37381-2000

Mike Skaggs
Site Vice President, Watts Bar Nuclear Plant

MAR 1 4 2006

10 CFR 50.73

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Gentlemen:

In the Matter of	)	Docket No. 50-390
Tennessee Valley Authority	)	

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1 - FACILITY OPERATING LICENSE NPF-90 - LICENSEE EVENT REPORT (LER) 50-390/2006-001

This submittal provides LER 390/2006-001. This LER documents an event where air voids were found in the backup safety-related Essential Raw Cooling Water (ERCW) supply to the Auxiliary Feedwater (AFW) system. As a result of this, the event is being reported as an operation or condition prohibited by the Technical Specifications in accordance with 10 CFR 50.73(a)(2)(i)(B). This event is also being reported under 10 CFR 50.73(a)(2)(v)(A) and (D) as an event or condition that could have prevented the fulfillment of the safety function.

There are no regulatory commitments associated with this letter. Should there be questions regarding this submittal, please contact Paul L. Pace at (423) 365-1824.

Sincerely,

Mike Skaggs

Enclosure:
LER 390/2006-001

cc: See page 2

IE22

MAR 1 4 2006

cc (Enclosure):

NRC Resident Inspector
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

Douglas V. Pickett, Senior Project Manager
U.S. Nuclear Regulatory Commission
MS 08G9a
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, Georgia 30303

Institute of Nuclear Power Operations
700 Galleria Parkway, NW
Atlanta, Georgia 30339-5957

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE

Entrained Air in Essential Raw Cooling Water (ERCW) Piping

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	13	2006	2006	- 001 -	00	03	14	2006		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

Mode 1

10. POWER LEVEL

100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☑ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☑ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☑ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Jerry Bushnell, WBN Licensing Engineer	(423) 365-8048

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☑ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

The backup safety-related water supply for the Auxiliary Feedwater (AFW) system is provided by the Essential Raw Cooling Water (ERCW) system. On January 13, 2006, an attempt was made to take a chemistry sample of a portion of the ERCW piping. At this time, a sample could not be obtained due to air in the piping. The piping involved included; 1) a section of 12 inch ERCW supply piping to the Train B Motor Driven AFW (MDAFW) pump and to the Turbine Driven (TDAFW) pump, 2) a section of the 30 inch ERCW Train B discharge header that ties to the 12 inch ERCW line. Troubleshooting activities were initiated to vent the affected ERCW supply piping to the AFW system. Ultrasonic testing of the affected piping was implemented to ensure the piping was properly filled. The Train A backup ERCW supply to the AFW system was also verified to be operable. The air in the 12 inch ERCW line was caused by an inadequate fill and vent of the line during work performed in the Cycle 6 refueling outage. For the 30 inch discharge header, the gas void was determined to have resulted from dissolved gases in the water coming out of solution and collecting in the piping. The corrective actions included the establishment of continuous vent paths for the 30 inch ERCW Train A and B discharge headers and the addition of ultrasonic equipment for the verification of the water level in the 30 inch headers.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

I. Plant Conditions:

On January 13, 2006, WBN Unit 1 was in Mode 1 at 100 percent reactor thermal power.

II Description of Event:

A. Event:

The preferred water source for the Auxiliary Feedwater (AFW - EIIS BA) system is the non-safety related Condensate Storage Tank (CST - EIIS KA). The backup safety-related supply for the AFW system is an unlimited source provided by the Essential Raw Cooling Water (ERCW - EIIS BI) system. On January 13, 2006, an attempt was made to sample a portion of the ERCW piping in accordance with Chemistry Manual (CM) Chapter 4.08, "Non-Oxidizing Biocide Injection into the Auxiliary Feedwater ERCW B Supply Line for Control of Asiatic Clams, Zebra Mussels." As part of the sampling process valve 1-VTV-067-0945-B (EIIS VTV), was opened for the collection of a water sample. However, no sample could be obtained at this time due to entrained air in the piping.

The piping involved in the sampling included a section of 12 inch diameter ERCW Train B supply piping to the AFW system. This piping feeds the Train B Motor Driven AFW (MDAFW - EIIS P) pump and also provides the Train B ERCW supply to the Turbine Driven (TDAFW - EIIS P) pump. Subsequently, the 12 inch pipe was found to contain air pockets in the vicinity of three vent valves (1-VTV-067-0923-A, 1-VTV-067-0945-B, and 1-VTV-067-0947A-B) which are located at three high points in the piping. Ultrasonic testing (UT) was performed on the 12 inch supply line and on the area where the 12 inch line intersects with the 30 inch ERCW Train B discharge header. This testing confirmed the lines were only partially full of water. Based on this, the Train B ERCW supply to the MDAFW pump and the TDAFW pump was determined to be inoperable and Condition F of Limiting Condition for Operation (LCO) 3.3.2, "Engineered Safety Feature Actuation System (ESFAS - EIIS JE) Instrumentation," was entered.

Troubleshooting activities were initiated under Work Order (WO) 06-810172 to vent the affected ERCW supply piping. Each of the three vent valves (1-VTV-067-0923-A, 1-VTV-067-0945-B, and 1-VTV-067-0947A-B) was opened to ensure the piping was completely filled. At approximately 18:51 on January 13, 2006, water began flowing from 1-VTV-067-0923-A, 1-VTV-067-0945-B and 1-VTV-067-0947A-B. The vents were isolated and UT measurements were taken to verify the piping was water solid. Ultrasonic measurements were also taken on the 30 inch ERCW Train B discharge header in the vicinity of the horizontal tee to the 12 inch AFW pump supply. Indications from the UT analysis revealed that the 30 inch ERCW header was not full and the level was below the top of the 12 inch ERCW supply to the AFW pumps. Vent valve 1-VTV-067-0947A-B was opened to establish a continuous vent path to assist in removing the entrained air. In addition to the venting process, the ERCW discharge flow path was re-aligned from the Cooling Tower Basin to the Yard Holding Pond, which is at a higher elevation. Redirecting the ERCW flow from the Cooling Tower Basin provides several additional feet of head on the discharge piping which shrunk the air pocket in the discharge header, allowing a higher level to be maintained.

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

II. DESCRIPTION OF EVENT (continued)

A. Event (continued):

At about noon on January 14, 2006, venting was performed through ERCW piping associated with Main Control Room Chiller (EIIS CHU) B (0-VTV-67-624B) to ensure the 30 inch header was completely filled. Subsequently, a compensatory measure was established for the continuing use of 0-VTV-67-624B to vent the 30 inch header until a suitable permanent venting process can be established. Further, the Train A ERCW supply to the AFW system was verified to be operable.

The air in the 12 inch ERCW line was determined to have been caused by an inadequate fill and vent of the line during work performed in the Cycle 6 refueling outage. For the 30 inch discharge header, the gas void was determined to have resulted from dissolved gases in the water coming out of solution and collecting in the piping. This is a result of the pressure and temperature changes occurring as the ERCW is used to cool various plant components.

As indicated previously, the Train B ERCW supply to the AFW pumps was determined to be inoperable and Condition F of LCO 3.3.2 was entered. In accordance with Condition F, the affected train must be restored within 48 hours. As indicated above, the 12 inch ERCW line was determined to have not been properly filled and vented during the Cycle 6 outage. LCO 3.3.2 is applicable for the AFW suction transfer function in Modes 1, 2 and 3. Mode 3 was entered on March 26, 2005, during startup following the Cycle 6 outage. Considering this, the function of the LCO was inoperable from March 26, 2005, until January 13, 2006, when the line was vented and verified to be full of water. The duration the LCO function was inoperable was longer than the 48 hour allowed outage time. Therefore, this condition is being reported as an operation or condition prohibited by the Technical Specifications in accordance with 10 CFR 50.73(a)(2)(i)(B).

It is unknown how often or for how long, air voids may have been forming in the 30 inch ERCW discharge line. For the event discussed in this LER, the voids in the 30 inch line were significant enough to have impacted the availability of the backup water supply to the AFW system. TVA has concluded that the ERCW discharge header was likely impaired whenever river temperatures were low and flow through the system was decreased (one pump operation).

Over the previous three years of the reportability evaluation period, voids in the 12 inch or 30 inch ERCW lines may have occurred coincident with periods the A Train AFW pump was out of service for maintenance and testing. For calendar years 2003 through 2005, the A Train MDAFW pump was unavailable for a total of 153 hours (an average of 51 hours per year). Because WBN has no data to confirm the size, extent or duration of the voids during this period, no firm conclusion can be made regarding the impact of the voids on the availability of this backup supply to AFW. However, since startup following the Cycle 6 refueling outage, Train A of the AFW system has been unavailable for approximately 37.5 hours. Due to this, this event is being reported under 10 CFR 50.73(a)(2)(v)(A) and (D) as an event or condition that could have prevented the fulfillment of the safety function.

This event was documented in TVA's Corrective Action Program as Problem Evaluation Report 95337.

B. Inoperable Structures, Components, or Systems that Contributed to the Event

There were no additional structures, components or systems inoperable at the start of the event that contributed to the event.

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II. DESCRIPTION OF EVENT (continued)

C. Dates and Approximate Times of Major Occurrences

Date & Time	Occurrences
March 26, 2005	Mode 3 was entered during startup following the Cycle 6 outage. During the outage and prior to the entry into Mode 3, the Train B 12 inch ERCW supply line was not adequately filled and vented.
January 13, 2006 - 13:19	Condition F of LCO 3.3.2 is entered due to the Train B ERCW supply being inoperable due to air voids in the piping. The allowed outage time is 48 hours.
January 13, 2006 - 17:35	Power is removed from the Train B motor operated valves (MOVs) that are used to transfer the AFW supply from the CST to the ERCW. This action deenergizes the status indication for the MOVs and Condition A of LCO 3.3.3, Post Accident Monitoring (PAM) Instrumentation was entered.
January 13, 2006 - 18:51	The Train B 12 inch ERCW supply piping is vented and determined to be water solid.
January 13, 2006 - 23:49	WO 06-810174 is initiated to address the air in the Train B 30 inch ERCW discharge piping. This line was vented through valve 1-VTV-67-947A-B.
January 14, 2006 - 02:50	The Train B 12 inch piping is verified to be full of water. The ultrasonic testing (UT) of the Train B 30 inch pipe indicates that there is approximately 25 inch of water in the pipe.
January 14, 2006 - 17:30	An evaluation is initiated of the condition of the Train A ERCW emergency supply to the AFW system.
January 14, 2006 - 19:28	LCO 3.3.3 is exited.
January 14, 2006 - 19:31	Based on the venting actions taken and a functional evaluation performed by WBN's Engineering staff, the Train B ERCW supply to the AFW system is considered operable and LCO 3.3.2 is exited.
January 14, 2006 - 23:13	A UT examination of the Train A ERCW piping establishes the piping is full of water.

D. Other Systems or Secondary Functions Affected

No other systems or secondary functions were affected by this event.

17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

II. DESCRIPTION OF EVENT (continued)

E. Method of Discovery

On January 13, 2006, Chemistry personnel attempted to sample a portion of the ERCW piping in accordance with CM Chapter 4.08, "Non-Oxidizing Biocide Injection into the Auxiliary Feedwater ERCW B Supply Line for Control of Asiatic Clams, Zebra Mussels." As part of the sampling process, valve, 1-VTV-067-0945-B, was opened for the collection of the water sample. A sample could not be obtained at this time due to entrained air in the piping.

F. Operator Actions

Once notified of the condition, the Operations staff entered the applicable LCOs for the equipment that was determined to be inoperable. Subsequently, the Operations staff initiated a meeting in accordance with Standard Department Procedure OPDP-9, "Emergent Issue Response," to establish a plan for the filling and venting of the Train B ERCW piping. The Operations staff continued to monitor the actions taken to vent the ERCW piping and exited the LCOs once the piping was determined to be properly filled.

G. Safety System Responses

There were no automatic or manual safety system responses and none were necessary.

III. CAUSE OF EVENT

A. Air Void in 12 inch ERCW Line to the AFW Pumps:

Provided on the following page is a diagram of the Train B ERCW supply piping to the AFW system. The three high points in this piping segment are marked as A, B, and C. Varying amounts of air were found at each of the three points. The evaluation of this condition determined the principal cause to be the inadequate filling and venting of the piping during the Cycle 6 refueling outage. The venting during the outage was performed after radiographic testing and the flushing of the pipe.

B. Air Void in 30 inch ERCW Discharge Line:

TVA's evaluation of the air in the 30 inch discharge header determined that the voids were formed by gases dissolved in the water coming out of solution and collecting in the pipe. The evaluation also determined that the release of the dissolved gas is more likely to occur during the cold periods of the year. The basis for this is that cold water holds more dissolved gas than hot water. Also, pressurized water holds more dissolved gas than non-pressurized water. Water supplied by the ERCW pumps is pressurized and becomes heated by various heat exchangers or room coolers and is subsequently released to a discharge header at a substantially reduced pressure. The combination of low pressure and increased temperature results in the release of dissolved gases.

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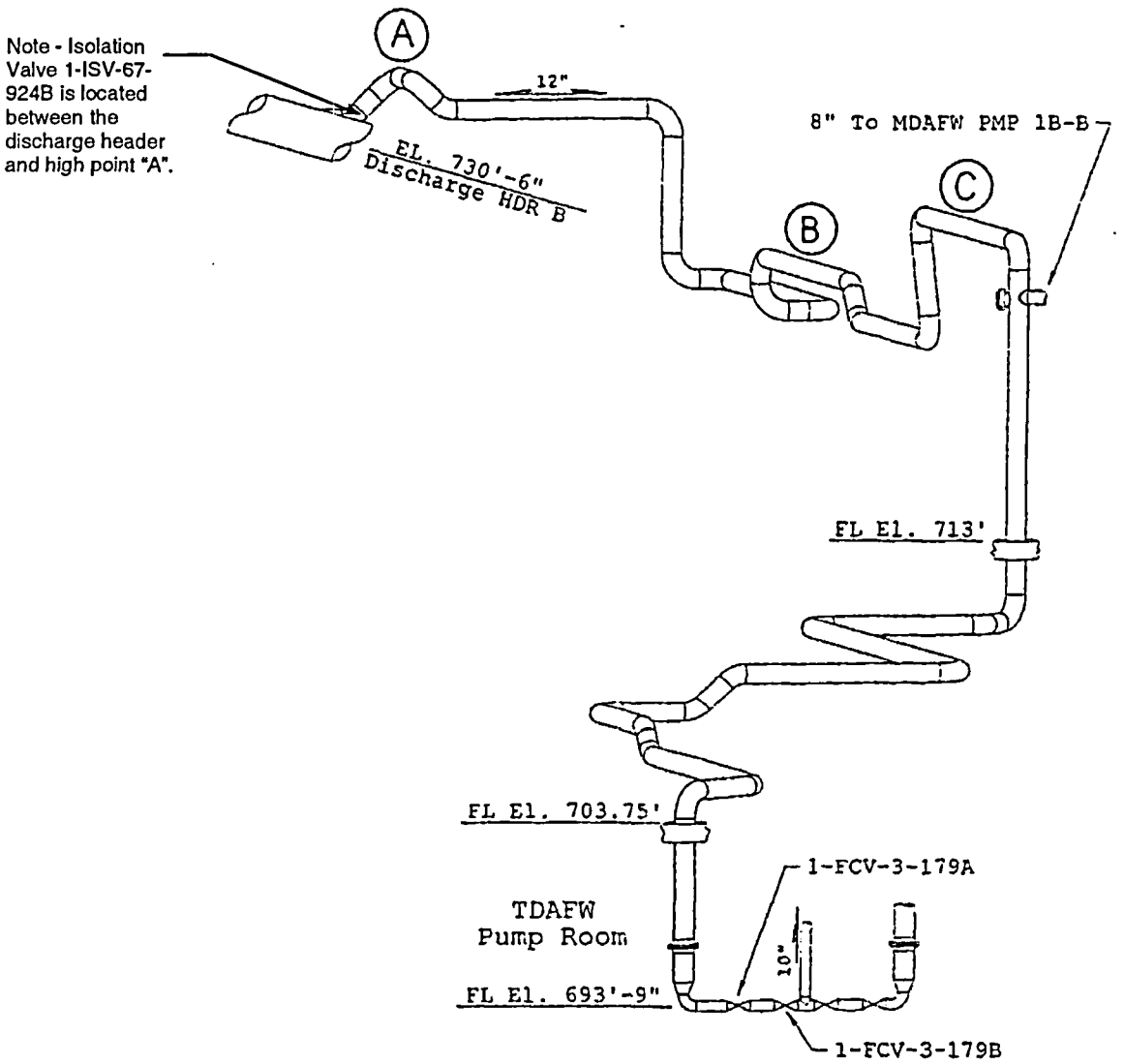
III. CAUSE OF EVENT (continued)

Diagram of Train B ERCW Supply Piping to AFW System



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IV. ASSESSMENT OF SAFETY CONSEQUENCES

The CST provides a non-safety grade water source to feed the AFW system. The safety grade water source for the AFW system is provided by the ERCW system. The Technical Specification (TS) Bases for LCO 3.7.6, "CST," indicates that the CST is the preferred source of water to the steam generators for removing decay and sensible heat from the Reactor Coolant System (RCS - EIIS AB). The Bases for LCO 3.7.6 also clarifies that the CST is not designed to withstand earthquakes and other natural phenomena, including missiles that might be generated by natural phenomena. The seismic qualification of the CST is also discussed in Section 9.2.6.1, "Condensate Storage Facilities - Design Bases," of the Updated Final Safety Analysis Report (UFSAR). For WBN, the probability of such events occurring and impacting the CST is low.

The information provided in Section 4.1, "Operating Basis Earthquake (OBE) Event," and Section 4.2, "Safe Shutdown Earthquake (SSE) Event," of Design Criteria WB-DC-40-64, "Design Basis Events Design Criteria," indicates that a Loss of Offsite Power (LOOP) event must be considered concurrent with an OBE and an SSE. The discussion provided in WB-DC-40-64 also clarifies that no additional events must be considered concurrent with an OBE and an SSE. Table 5, "System Operational Flow Requirements Matrix - Accident Analysis," of System Description N3-3B-4002, "Auxiliary Feedwater System," clarifies for a LOOP event that one AFW pump is required to mitigate the event. As stated previously, the initial actions taken in response to finding the air voids the Train B ERCW supply included verifying the Train A ERCW supply to the AFW system contained no air voids. Therefore, the Train A MDAFW pump was not impacted by the ERCW air issue and the one required AFW pump along with its emergency supply was available at the time the air was discovered in the Train B ERCW supply.

The three year reportability period for this event is from January 2003 until January 2006. During this evaluation period, voids in the 12 inch or 30 inch ERCW lines may have occurred coincident with periods the A Train AFW pump was out of service for maintenance and testing. For calendar years 2003 through the beginning of the Cycle 6 refueling outage on February 22, 2005, the A Train MDAFW pump was unavailable for a total of 115.5 hours. Because WBN has no data from this period to confirm the size, extent or duration of the voids, no firm conclusion can be made regarding the impact of the voids on the availability of this backup supply to AFW prior to the Cycle 6 refueling outage. Since unit startup following the Cycle 6 refueling outage, Train A of the AFW system has been unavailable for approximately 37.5 hours. The coincident combination of the A Train being inoperable and an air void being present in either of the ERCW lines along with the likelihood of an external event resulting in the loss of the CST is thought to be low. Had an external event occurred resulting in the loss of the CST, operators would have quickly identified problems with ERCW supply to the AFW and have taken actions to restore the Train A MDAFW pump to service.

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V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

1. As stated previously, action was taken to vent the 12 inch supply line to the AFW pumps and to vent the 30 inch discharge header. UT measurements were taken of both lines to verify the piping was properly filled.

2. The Train A ERCW supply to the AFW system was verified to be operable.

3. Action was initiated to determine the cause of the gas voids and to establish the proper actions to prevent recurrence of voids.

B. Corrective Actions to Prevent Recurrence - (TVA does not consider these items to constitute regulatory commitments and additional measures may be taken beyond the actions listed. The listed actions and any other measures deemed appropriate, are tracked in TVA's corrective action program.)

1. Surveillance Instructions (SIs) 1-SI-3-903-B, "Valve Full Stroke Exercising during Plant Operation - Auxiliary Feedwater (Train B)," and 1-SI-3-908, "Valve Full Stroke Exercising During Plant Operation - Turbine Driven Auxiliary Feedwater," were placed on administrative hold. This action was taken to ensure the instructions are not used until a planned revision is completed. The revision will provide controls to minimize air intrusion into upstream piping and to ensure that the ERCW Train B supply header to the AFW system is filled and vented if necessary, following opening and closing of Flow Control Valves (FCVs) 1-FCV-3-179A and 1-FCV-3-126A (EIIS FCV).

2. A temporary alteration was implemented on Main Control Room (MCR) Chillers A-A and B-B cooling water discharge lines. This modification provides a continuous vent path for the 30 inch ERCW Train A and Train B discharge headers through Vent Valves 0-VTV-67-624A and 0-VTV-67-624B. Ultrasonic equipment was also installed so that the water level in the headers may be periodically verified.

3. Design Change Notice (DCN) 52011 was initiated to establish a permanent means to vent the 30 inch discharge ERCW headers.

VI. ADDITIONAL INFORMATION

A. Failed Components

There were no failed components involved in this LER.

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VI. ADDITIONAL INFORMATION (continued)

B. Previous LERs on Similar Events

For WBN, there have been no previous events related to air intrusion into a raw water system.

C. Additional Information:

None.

D. Safety System Functional Failure

This event involved a safety system functional failure as defined in Nuclear Energy Institute (NEI) 99-02, Revision 3.

E. Loss of Normal Heat Removal Consideration

This event is not considered a scram with loss of normal heat removal.

VII. COMMITMENTS

None