October 3, 2008

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 – LICENSEE EVENT REPORT 390/2008-002, REVISION 0 – MANUAL REACTOR TRIP IN RESPONSE TO START OF FEEDWATER HEATER ISOLATION

This submittal provides LER 390/2008-002. This LER documents an event where the reactor was manually tripped during a downpower because feedwater heaters strings were beginning to isolate. The report regarding this condition is provided in accordance with 10 CFR 50.73(a)(2)(iv)(A).

There are no regulatory commitments associated with this submittal. If you have any questions concerning this matter, please contact Mike Brandon at (423) 365-1824.

Sincerely,

Original signed by

Mike Skaggs
Site Vice President
Watts Bar Nuclear Plant

Enclosure
cc: See Page 2

Enclosure
cc (Enclosure):

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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010

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

Manual Reactor Trip in Response to Start of Feedwater Heater Isolation

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
									N/A	N/A
08	07	2008	2008	- 002 -	0	10	06	2008	FACILITY NAME: N/A	DOCKET NUMBER: N/A

9. OPERATING MODE

1

10. POWER LEVEL

53%

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

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Michelle Pope, Licensing Engineer	(423) 365-8138

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
B	LD			Y					

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)*

During a planned shutdown on August 7, 2008, unexpected annunciator alarms were received in the control room that indicated hi level in the A and B feedwater heater strings. The reactor was manually tripped when indication was received that the third string, C, was beginning to isolation.

An event team was assembled subsequent to the plant trip. The cause was determined to be a failed air line on the Heater Drain Tank bypass to condenser valve. This air line failure was most likely due to vibration fatigue caused by improper installation. Corrective action was taken to replace this line in accordance with vendor requirements.

As a result of the plant trip, the actuation of the Reactor Protection and the Auxiliary Feedwater Systems were reported in accordance with 10 CFR 50.72(b)(2)(iv)(B) and 10 CFR 50.72(b)(3)(iv)(A), respectively. This event is also being reported as this Licensee Event Report in accordance with 10 CFR 50.73(a)(2)(iv).

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NARRATIVE

I. PLANT CONDITIONS:

On August 7, 2008, the shutdown of WBN Unit 1 was in progress. The events discussed in LER 2008-002 occurred when the unit was at approximately 53% power.

II. DESCRIPTION OF EVENT:

A. Event:

On August 7, 2008, Watts Bar 1 was shutting down to make a repair to the stator water cooling system (EIIS TJ). With the plant near 53% power, operators secured both #7 heater drain tank (HDT) (EIIS TK) pumps (EIIS P), in accordance with the plant shutdown procedure. HDT level should have been maintained by its bypass to condenser valve (EIIS V), but the level control valve's air signal line had failed, so the valve failed to open. The high HDT level caused levels in the low pressure feedwater heaters (EIIS HX) to rise until they reached the automatic isolation set point on all three feedwater heater strings. The operators then manually tripped the plant. All systems performed their intended safety functions in response to the trip.

This event is addressed in TVA's Corrective Action Program as Problem Evaluation Reports (PERs) 149778 and 149790.

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.

C. Dates and Approximate Times of Major Occurrences

Date	Time (EDT)	Event
August 6, 2008	23:10	Load reduction from about 80% was initiated at about 10% per hour in accordance with GO-4.
August 7, 2008	00:46	The #7 B HDT pump was shut down per SOI-5&6.01. Reactor power was at 70% (U2125).
August 7, 2008	02:12	The #7 A HDT pump was shut down per SOI-5&6.01. Reactor power was at 56% (U2125).
August 7, 2008	02:22	Annunciator (EIIS ANN) alarms were received: - 36-E HEATER A6 LEVEL HI/LO - 37-E HEATER B6 LEVEL HI/LO
August 7, 2008	02:23	Annunciator alarm was received: - 38-E HEATER C6 LEVEL HI/LO
August 7, 2008	02:28	A manual reactor trip was initiated in accordance with E-0 due to the isolation of the low pressure heater strings. Reactor power was at 53% (U2125).

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

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II. DESCRIPTION OF EVENT (continued):

D. Other Systems or Secondary Functions Affected

The plant trip was normal except that the response of the auxiliary feedwater (EIIS BA) level control valves (EIIS LCV) caused the steam generator (EIIS SG) levels to swing. When this was observed, operators placed the valves into manual control. The valves controlled level properly in the manual state. This anomaly was documented in PER 150508.

E. Method of Discovery

Plant personnel identified, through control room indications, that the A and B string low pressure heaters were isolating. Operators discussed and established manual reactor trip criteria and once the C string began to isolate, the plant was manually tripped, as established.

F. Operator Actions

The Operations staff (licensed personnel) responded to the event by manually tripping the reactor. The crew met all Operations standards and expectations, and no human performance issues were identified.

G. Safety System Responses

All systems performed their intended safety functions.

III. CAUSE OF EVENT

The manual trip was the operator response to the low pressure feedwater heater string isolation caused by failure of the #7 bypass level control valve (LCV). The LCV failure was caused by failure of the signal air line. The air line, a stainless steel bellows type flexible hose that is enclosed in a stainless steel braid, failed due to vibration induced fatigue as a result of improper installation; in that, minimum bend radius and maximum arc recommendations were not known and therefore not followed. The work order for installing these hoses did not contain vendor requirements specifying the allowed bend radius and arc allotments for installation.

IV. ANALYSIS OF THE EVENT

Plant safety systems performed intended safety functions in response to the manual reactor trip. The plant was stabilized using Auxiliary Feedwater and the Main Steam (EIIS SB) dump valves. See Section V, “Assessment of Safety Consequences,” below for further discussion.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The manual reactor trip on 08/07/2008 was compared to the FSAR "Loss of Normal Feedwater Event," UFSAR section 15.2.8 (page 15.2-25). The reactor was manually tripped at approximately 02:28 (53% power, U2125) due to secondary side low pressure heater string isolations. The heater string isolations occurred because the # 7 HDT bypass to condenser control valve (1-LCV-006-0190B) failed to open which caused levels in the #7 HDT and associated low pressure heaters to increase, resulting in subsequent low pressure heater string isolations (all three strings). The "A” heater string isolated first, then "B" string isolated. Moments later "C" string began to isolate, and Operators manually tripped the reactor. The manual reactor trip occurred before SG water level reached the low-low setpoint. The plant was stabilized using Auxiliary Feedwater (AFW) and the Main Steam dump valves.

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V. ASSESSMENT OF SAFETY CONSEQUENCES (continued)

The secondary side steam generator (SG) atmospheric relief valves (EIIS RV) and safety valves were not challenged during the transient. The reactor coolant system (EIIS AB) responded to the initial transient as expected with no pressurizer PORV relief and no safety injection initiation.

The FSAR analysis assumes the reactor trip is caused by low-low water level in any SG and in this case was initiated by operator action before steam generator levels decreased to the low-low setpoint. In addition, no credit is taken for the steam dump system, and no credit is taken for the SG atmospheric relief valves (only steam generator safety valves are credited). The actual event had steam dumps and SG atmospheric relief valves available. The FSAR assumes that the plant is initially operating at 110.6% of the Nuclear Steam Supply System (NSSS) power level while the manual reactor trip occurred at approximately 50% power. Failure of the Turbine Driven (TD) AFW pump is assumed in the FSAR. The TD AFW pump, along with both Motor Driven (MD) AFW pumps, started within the required 60 second response time and were available for decay heat removal.

Therefore, the 08/07/2008 trip is bounded by the FSAR safety analysis assumptions.

VI. CORRECTIVE ACTIONS - The corrective actions for this condition are being managed within TVA's Corrective Action Program (PERs 149778 and 149790) and therefore are not considered to be regulatory commitments. An overview of the corrective action plan is provided below:

A. Immediate Corrective Actions

1. When the A and B string low pressure heaters began isolating, monitoring for C isolation began. Once this indication was received, the immediate action was to trip the reactor.

B. Corrective Actions to Prevent Recurrence

1. The failed air line was replaced with the same type hose with the configuration modified to comply with manufacturer installation requirements.

2. A walkdown of all critical air operated valves in the Turbine Building and the valve vaults was performed. Of the 81 valves inspected, three were found with discrepancies. One had an abrasion of the braid and a severe twist, and one had a sharp bend. The third had a piece of bent copper tubing at the end of a hose. The hoses and tubing were replaced according to vendor installation requirements. Extent of condition was restricted to the turbine building. Safety related installations of flexible tubing are controlled by the modification process which provides explicit installation details.

3. A walkdown of the four replaced air lines was performed by the system engineer with an attribute checklist to ensure proper installation.

4. The post maintenance testing for hose installation was reviewed for adequacy.

5. The maintenance procedures will be modified to clearly specify the vendor installation requirements for hoses.

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VII. ADDITIONAL INFORMATION

A. Failed Components

The main failed component associated with this event is the flexible metal hose, as discussed above.

B. Previous LERs on Similar Events

A review was performed of the previous WBN Licensee Event Reports (LERs) for any events associated with high feedwater heater level. LER 1997-015 documents a series of events where the reactor was manually tripped during plant startup due to decreasing steam generator levels resulting from isolation of feedwater heaters. The cause of the 1997 event was that additional operator attention was not provided to control the heater level during the turbine roll and main generator synchronizing. This extra oversight should have been required because the C1 heater was out of service. The issues documented in LER 1997-015 were not related to heater isolation during down power or caused by failed air lines. No other relevant WBN LERs were identified.

C. Additional Information:

None.

D. Safety System Functional Failure

This event did not involve a safety system functional failure as defined in NEI 99-02, Revision 5.

E. Loss of Normal Heat Removal Consideration

There was no loss of normal heat removal due to this condition.

VIII. COMMITMENTS

None.