



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

May 10, 2016

10 CFR 50.73

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

Watts Bar Nuclear Plant, Unit 1  
Facility Operating License No. NPF-90  
NRC Docket No. 50-390

Subject: **Licensee Event Report 390/2016-003-00, Technical Specification  
Surveillance Requirement Not Met During Emergency Core Cooling  
System Venting**

This submittal provides Licensee Event Report (LER) 390/2016-003-00. This LER provides details concerning a failure to meet Surveillance Requirement 3.5.2.3 during ECCS Venting. This report is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(B).

Please direct any questions concerning this matter to Gordon Arent, WBN Licensing Director, at (423) 365-2004.

Respectfully,

A handwritten signature in black ink, appearing to read "Paul Simmons", is written over a horizontal line.


Paul Simmons  
Site Vice President  
Watts Bar Nuclear Plant

Enclosure  
cc: See Page 2

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cc (Enclosure):

NRC Regional Administrator - Region II  
NRC Senior Resident Inspector - Watts Bar Nuclear Plant

<b>NRC FORM 366</b> (11-2015)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>			<b>APPROVED BY OMB: NO. 3150-0104</b>		<b>EXPIRES: 10/31/2018</b>			
 <b>LICENSEE EVENT REPORT (LER)</b> (See Page 2 for required number of digits/characters for each block)					Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@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.					
<b>1. FACILITY NAME</b> Watts Bar Nuclear Plant					<b>2. DOCKET NUMBER</b> 05000390		<b>3. PAGE</b> 1 OF 6			
<b>4. TITLE</b> Technical Specification Surveillance Requirement Not Met During Emergency Core Cooling System Venting										
<b>5. EVENT DATE</b>			<b>6. LER NUMBER</b>			<b>7. REPORT DATE</b>			<b>8. OTHER FACILITIES INVOLVED</b>	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	11	2016	2016	- 003	- 00	05	10	2016	N/A	N/A
									N/A	N/A
<b>9. OPERATING MODE</b>			<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>							
1			<input type="checkbox"/> 20.2201(b)		<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
			<input type="checkbox"/> 20.2201(d)		<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
			<input type="checkbox"/> 20.2203(a)(1)		<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)	
			<input type="checkbox"/> 20.2203(a)(2)(i)		<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)	
			<input type="checkbox"/> 20.2203(a)(2)(ii)		<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)	
100			<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)	
			<input type="checkbox"/> 20.2203(a)(2)(iv)		<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> 73.77(a)(1)	
			<input type="checkbox"/> 20.2203(a)(2)(v)		<input type="checkbox"/> 50.73(a)(2)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(D)		<input type="checkbox"/> 73.77(a)(2)(i)	
			<input type="checkbox"/> 20.2203(a)(2)(vi)		<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(vii)		<input type="checkbox"/> 73.77(a)(2)(ii)	
					<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> OTHER		Specify in Abstract below or in NRC Form 366A	
<b>12. LICENSEE CONTACT FOR THIS LER</b>										
LICENSEE CONTACT Thomas P. Morgan								TELEPHONE NUMBER (Include Area Code) 423-365-1557		
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	
<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO						<b>15. EXPECTED SUBMISSION DATE</b>				
						MONTH	DAY	YEAR		
<b>ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)</b> On March 11, 2016, Watts Bar Nuclear Plant (WBN) Unit 1 concluded that a condition prohibited by Technical Specification (TS) Limiting Condition for Operation (LCO) 3.5.2, ECCS - Operating, had occurred during recent performances of TS Surveillance Requirement (SR) 3.5.2.3. Due to inadequacies with gas quantification methodologies for Safety Injection (SI) and Residual Heat Removal (RHR) system discharge piping, the ability to meet TS SR 3.5.2.3 could not be demonstrated, which is required in accordance with TVA's response to NRC Generic Letter 2008-01, "Managing Gas Accumulation In Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems." This condition existed from March 2012 to December 2015. In a subsequent analysis, WBN determined that the worst case gas accumulation in SI and RHR discharge piping would not have affected the ability of the SI and RHR systems from performing their safety functions. However, because the required actions of TS LCO 3.5.2 were not taken within the required times, WBN was in a condition prohibited by Technical Specifications.  TVA is reporting this issue pursuant to 10 CFR 50.73(a)(2)(i)(B).										

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(11-2015)

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## LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
Watts Bar Nuclear Plant	05000390	YEAR	SEQUENTIAL NUMBER	REV NO.
		2016	- 003	- 00

### NARRATIVE

#### I. PLANT OPERATING CONDITIONS BEFORE THE EVENT

Watts Bar Nuclear Plant (WBN) Unit 1 was in Mode 1 at 100 percent rated thermal power (RTP).

#### II. DESCRIPTION OF EVENT

##### A. Event

NRC Generic Letter GL-2008-01, was issued to address gas accumulation in the ECCS. One of the principal concerns of the GL was the Licensing Basis for plants to verify emergency core cooling systems are full of water, including an assessment of gas accumulation to establish operability.

Tennessee Valley Authority (TVA's) response to GL 2008-01 was to install a number of additional high point vents in the affected systems and revise applicable procedures to provide for timing of gas releases in order to allow for evaluation of accumulated gas. WBN's response to GL 2008-01 did not include a specific methodology for quantifying gas accumulation in Emergency Core Cooling System (ECCS) discharge piping. However, WBN stated that any gas releases subsequent to purging of the vent pipe would indicate a condition requiring further evaluation in the Corrective Action Program. Technical Specification (TS) Limiting Condition for Operation (LCO) Section 3.5.2 requires two ECCS trains to be operable, and TS Surveillance Requirement (SR) 3.5.2.3 requires verification that the ECCS is full of water at a frequency of 31 days.

During review of the surveillance performed on December 9, 2015, it was discovered that WBN's surveillance requirement implementing procedures did not contain an adequate methodology for quantifying gas accumulation in Safety Injection (SI) [EIS:BQ] and Residual Heat Removal (RHR) [EIS:BP] discharge piping. In addition, there was no site-specific acceptance criteria for accumulated gas to fulfill the TS requirements of verifying the ECCS piping is full of water. Subsequent analysis demonstrated that the ECCS was capable of performing its safety function, even with the maximum possible amount of gas intrusion.

As a result of the above inadequacies in ECCS gas intrusion quantification and venting methodologies, WBN could not demonstrate that TS SR 3.5.2.3 was met from March 2012 to December 2015.

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

No inoperable structures, components, or systems contributed to this event.

##### C. Dates and Approximate Times of Occurrences

Date	Event
06/03/2011	WBN response to GL 2008-01 closed out by NRC
01/31/2012	WBN receives Non-Cited Violation (NCV) related to GL 2008-01 response
March 2012- December 2015	Surveillance Instructions to satisfy TS 3.5.2 did not adequately quantify gas accumulation in ECCS discharge piping
12/09/2015	Surveillance Instruction SR 1-SI-63-10.1-A performed (later determined invalid)

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Date	Event
02/17/2016	Missed Surveillance declared
January 2016 - March 2016	Revisions made to Surveillance Instructions for ECCS venting to perform a quantification of accumulated gas and clarify Acceptance Criteria.

#### D. Manufacturer and Model Number of Components that Failed

There were no failed components associated with this event.

#### E. Other Systems or Secondary Functions Affected

There were no systems or secondary functions affected by this event.

#### F. Method of discovery of each Component or System Failure or Procedural Error

There were no failed components associated with this event. There was however a failure to meet TS SR 3.5.2.3 due to inadequate methodologies in surveillance requirement implementing procedures. This was discovered during the review of Condition Report (CR) 1127959 which was initiated due to the surveillance performed on December 9, 2015.

#### G. Failure Mode and Effect of Each Failed Component

There were no component failures associated with this event.

#### H. Operator Actions

There was no actual event requiring operator actions.

#### I. Automatically and Manually Initiated Safety System Responses

There were no automatic or manual system responses associated with this event.


### III. CAUSE OF THE EVENT

#### A. The cause of each component or system failure or personnel error, if known.

There were no component or system failures as a result of this event.

#### B. The cause(s) and circumstances for each human performance related root cause.

An Event and Causal Factors Analysis was performed for the time period between March 2012 and December 2015. It was determined that there was a lack of understanding in both the Operations and Engineering organizations of the need to quantify gas accumulation as a part of meeting TS SR 3.5.2.3, as was required by WBN's response to GL 2008-01.

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<b>1. FACILITY NAME</b>  Watts Bar Nuclear Plant		<b>2. DOCKET NUMBER</b>  05000390		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3" style="text-align: left; padding: 2px;"><b>3. LER NUMBER</b></th> </tr> <tr> <th style="width: 33%; text-align: center; padding: 2px;">YEAR</th> <th style="width: 33%; text-align: center; padding: 2px;">SEQUENTIAL NUMBER</th> <th style="width: 33%; text-align: center; padding: 2px;">REV NO.</th> </tr> <tr> <td style="text-align: center; padding: 2px;">2016</td> <td style="text-align: center; padding: 2px;">- 003</td> <td style="text-align: center; padding: 2px;">- 00</td> </tr> </table>				<b>3. LER NUMBER</b>			YEAR	SEQUENTIAL NUMBER	REV NO.	2016	- 003	- 00
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<b>NARRATIVE</b>  <div style="margin-left: 20px;"> <b>IV. ANALYSIS OF THE EVENT</b>   <p>From March 2012 through September 2015, ECCS venting inside containment was accomplished by venting water into a bottle with entrained gas, then venting out the top through a totalizing meter used to measure the vented air. After the bottle was over-pressurized and cracked in July 2015, a new test rig was designed that used a series of break-down orifices and a stop watch to quantify the gas released. This test rig, utilized in November 2015 following the refueling and maintenance outages in September and November, was not successful in quantifying entrained gas, however; the venting was performed until there was a solid stream of water. In addition, the resulting times required to achieve a solid stream of water to verify the system was water solid were considered excessive and non-representative due to the significant amount of entrained gas. As a result, a new test rig was developed and utilized in December 2015. This new test rig replaced the plastic bottle with a steel bottle capable of withstanding higher pressures but did not have a means to directly verify a solid stream of water for satisfying the surveillance requirement. Subsequent to this surveillance, it was discovered that the flow meter used in the December 9, 2015, surveillance was not calibrated and was not included in the Measurement and Test Equipment program. These facts rendered the test invalid and as a result, a missed surveillance was declared. WBN's investigation determined that from the time period of March 2012 to December 2015, WBN Unit 1 surveillance requirement implementing procedures did not include an adequate methodology for quantifying gas accumulation in ECCS discharge piping, and there was no site-specific acceptance criteria for accumulated gas to fulfill the TS requirements of verifying the ECCS piping is full of water.</p> <p>An analysis was performed for the time period between March 2012 and the missed surveillance in December 2015. The analysis demonstrated that the ECCS was capable of performing its safety function, even with the maximum possible amount of gas intrusion. A water hammer analysis was also performed to simulate a water hammer event postulated to occur after an SI signal, and concluded that the piping and components would have been able to perform their safety functions. In addition, a Probabilistic Risk Assessment (PRA) concluded that since the ECCS safety function could have been performed during the time periods that the TS LCO 3.5.2 was determined to be not met, there is no increase to Core Damage Frequency.</p> <p>Based on the above, there were no actual consequences as a result of the missed surveillances. WBN surveillance requirement implementing procedures have been revised to meet TS SR 3.5.2.3 requirements by utilizing ultrasonic detection and an engineering evaluation to determine any void volume is within acceptable limits.</p> </div> <div style="margin-left: 20px;"> <b>V. ASSESSMENT OF SAFETY CONSEQUENCES</b>   <p>Analysis performed for the time period between March 2012 and the missed surveillance in December 2015, demonstrated that the ECCS was capable of performing its safety function, even with the maximum possible amount of gas intrusion. In addition, a PRA concluded there is no increase to Core Damage Frequency.</p> <p>A. Availability of systems or components that could have performed the same function as the components and systems that failed during the event.</p> <p>There were no failed components or systems. An analysis demonstrated that the ECCS was capable of performing its safety function, even with the maximum possible amount of gas intrusion.</p> </div>																

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- B. For events that occurred when the reactor was shut down, availability of systems or components needed to shutdown the reactor and maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, or mitigate the consequences of an accident

Not applicable.

- C. For failure that rendered a train of a safety system inoperable, an estimate of the elapsed time from the discovery of the failure until the train was returned to service

There was no loss of operability. The ECCS was capable of performing its safety function.

### VI. CORRECTIVE ACTIONS

This event was entered into the Tennessee Valley Authority (TVA) Corrective Action Program and is being tracked under CR 1127959.

#### A. Immediate Corrective Actions

WBN surveillance requirement implementing procedures were revised to meet TS SR 3.5.2.3 requirements utilizing ultrasonic detection and an engineering evaluation to determine the void volume is within acceptable limits.

#### B. Corrective Actions to Prevent Recurrence

An Event and Causal Factors Analysis was performed for the time period between March 2012 and December 2015. It was determined that there was a lack of understanding of the need to quantify gas accumulation as a part of meeting TS SR 3.5.2.3, as was required by WBN's response to GL 2008-01. A Performance Analysis/Training Needs Analysis was performed for Engineering and Operations organizations. The analysis determined that there is a need for training for both organizations. Corrective actions also include: 1) installation of a Temporary Modification to take Ultrasonic (UT) measurements at the high point vent locations, 2) quantification of void size in each location, 3) ensure that venting activities meet the requirement to verify the pipes are full in accordance with GL 2008-01, and 4) maintenance on check valves 1-CKV-63-634 and 1-CKV-63-635 which were determined to be the source of the elevated gas accumulation into the Cold Leg Injection lines. The check valve maintenance is scheduled to be complete at the next Unit 1 refueling outage.

### VII. ADDITIONAL INFORMATION

#### A. Previous similar events at the same plant

In NRC Inspection Report (IR) 05000390/2011005 issued January 31, 2012, the NRC identified a Green non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the licensee's failure to establish adequate procedures to identify accumulated gas in emergency core cooling systems. Specifically, the operations surveillance test procedures, 1-SI-63-10.1-A, "ECCS Discharge Pipes Venting – Train A Inside Containment," Rev 1 and 1-SI-63-10.2-A, "ECCS Discharge Pipes Venting – Train A Outside Containment," Rev 1, could allow accumulated gases inside ECCS to be vented without being quantified and evaluated for potential adverse impacts on system operability. TVA entered this issue in the corrective action program as PER 478095. The

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corrective actions included procedure revisions of 1-SI-63-10.1-A, 1-SI-63-10.2-A and 1-SI-63-10-B to include steps to clarify when stopwatch is to be started and stopped and directions for use of Test Valve on tubing, and specified use of ultrasonic testing to be preferred method of use. No other changes to the process of venting were implemented, and the Acceptance Criteria was not revised. In retrospect, these changes were determined to be ineffective. The procedure revisions were found to have inadequate instructions for quantifying gas accumulation in ECCS discharge piping, and there was no site-specific acceptance criteria for accumulated gas.

#### B. Additional Information

None.

#### C. Safety System Functional Failure Consideration

This condition did not result in a safety system functional failure.

#### D. Scrams with Complications Consideration

There was no scram associated with this report.

### VIII. COMMITMENTS

None.