



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

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June 24, 2011

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 390/2011-003, Mode Change without meeting Limiting Condition for Operation (LCO) 3.7.5**

This submittal provides Licensee Event Report (LER) 390/2011-003. This LER documents an incident where the Limiting Condition for Operation (LCO) 3.7.5 for the Auxiliary Feedwater System was not met. The condition is reported as an LER in accordance with WBN License Condition 2.G.

There are no regulatory commitments in this letter. Please direct any questions concerning this matter to Robert Clark, WBN Site Senior Licensing Engineer, at (423) 365-1818.

Respectfully,

A handwritten signature in black ink, appearing to read "D. E. Grissette", with a stylized flourish at the end.

D. E. Grissette  
Site Vice President  
Watts Bar Nuclear Plant

Enclosure  
cc: See Page 2

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Enclosure  
cc (Enclosure):

NRC Regional Administrator - Region II

NRC Senior Resident Inspector - Watts Bar Nuclear Plant

<b>NRC FORM 366</b> (10-2010)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>  <div style="text-align: center;"> <b>LICENSEE EVENT REPORT (LER)</b>           (See reverse for required number of digits/characters for each block)       </div>	
APPROVED BY OMB: NO. 3150-0104		EXPIRES: 10/31/2013	
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 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.			
<b>1. FACILITY NAME</b> Watts Bar Nuclear Plant		<b>2. DOCKET NUMBER</b> 05000390	<b>3. PAGE</b> 1 OF 4
<b>4. TITLE</b> Mode Change Without Meeting LCO 3.7.5			
<b>5. EVENT DATE</b>		<b>6. LER NUMBER</b>	
MONTH	DAY	YEAR	YEAR
05	14	2011	2011
		SEQUENTIAL NUMBER	REV NO.
		- 003 -	0
		MONTH	DAY
		06	24
		YEAR	2011
<b>7. REPORT DATE</b>			
<b>8. OTHER FACILITIES INVOLVED</b>			
FACILITY NAME		DOCKET NUMBER	
N/A		N/A	
FACILITY NAME		DOCKET NUMBER	
N/A		N/A	
<b>9. OPERATING MODE</b>  <div style="text-align: center;">3</div>		<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§:</b> (Check all that apply)	
<b>10. POWER LEVEL</b>  <div style="text-align: center;">0%</div>		<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(vii)	
		<input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(A)	
		<input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(viii)(B)	
		<input type="checkbox"/> 20.2203(a)(2)(i) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.73(a)(2)(iii) <input type="checkbox"/> 50.73(a)(2)(ix)(A)	
		<input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 50.36(c)(1)(ii)(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)(iii) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.73(a)(2)(v)(A) <input type="checkbox"/> 73.71(a)(4)	
		<input type="checkbox"/> 20.2203(a)(2)(iv) <input type="checkbox"/> 50.46(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 73.71(a)(5)	
		<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)(C) <input checked="" type="checkbox"/> OTHER	
		<input type="checkbox"/> 20.2203(a)(2)(vi) <input type="checkbox"/> 50.73(a)(2)(i)(B) <input type="checkbox"/> 50.73(a)(2)(v)(D)	
Specify in Abstract below or in NRC Form 366A			
<b>12. LICENSEE CONTACT FOR THIS LER</b>			
FACILITY NAME		TELEPHONE NUMBER (Include Area Code)	
Robert Clark, Senior Licensing Engineer		(423) 365-1818	
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>			
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER
REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT
REPORTABLE TO EPIX	MANU-FACTURER	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</b> (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)			
<p>On May 14, 2011, at 14:28 Eastern Daylight Saving Time (EDT), Watts Bar Nuclear Plant Unit 1 (WBN) entered Mode 3 with the Turbine Driven Auxiliary Feedwater (TDAFW) pump inoperable following maintenance during WBN Cycle 10 refueling outage. The inoperable condition was identified during performance of Surveillance Requirement (SR) 3.7.5.2 on May 16, 2011. The TDAFW pump failed SR 3.7.5.2 due to equipment failure, and the plant entered Limiting Condition for Operation (LCO) 3.7.5, Condition B. The faulty equipment was repaired and the TDAFW pump was re-tested in accordance with SR 3.7.5.2. The TDAFW pump met the acceptance criteria within the allowable time and the plant exited LCO 3.7.5 at 17:45 on May 19, 2011.</p> <p>Changing Modes when LCO 3.7.5 was not met was determined to be reportable as a condition prohibited by Technical Specifications in accordance with WBN License Condition 2.G.</p>			

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## I. PLANT CONDITIONS:

Plant in Mode 3 at 0% rated thermal power (RTP).

## II. DESCRIPTION OF EVENT:

## A. Event

On May 14, 2011, at 14:28 Eastern Daylight Saving Time (EDT), Watts Bar Nuclear Plant Unit 1 (WBN) entered Mode 3 with the Turbine Driven Auxiliary Feedwater (TDAFW) pump inoperable following maintenance during the WBN Cycle 10 refueling outage. The inoperable condition was identified during performance of Surveillance Requirement (SR) 3.7.5.2 on May 16, 2011. The TDAFW pump failed SR 3.7.5.2 due to equipment failure, and the plant entered Limiting Condition for Operation (LCO) 3.7.5, Condition B. The faulty equipment was repaired and the TDAFW pump was re-tested in accordance with SR 3.7.5.2. The TDAFW pump met the acceptance criteria within the allowable time and the plant exited LCO 3.7.5 at 17:45 on May 19, 2011.

Although the TDAFW pump was not known to be inoperable until performance of the surveillance, TVA concluded that the inoperability existed at the time that WBN entered Mode 3.

WBN had entered Mode 3 at 14:28 EDT on May 14, 2011. LCO 3.0.4 prohibits MODE changes when an LCO is not met except under certain conditions that were not applicable to this event. Therefore, TVA concluded that WBN entered Mode 3 without the required three operable trains of Auxiliary Feedwater (AFW).

In accordance with LCO 3.7.5, TVA also determined that the TDAFW pump was inoperable for a period of 123 hours and 17 minutes while the plant was in Mode 3, which exceeded the 96 hours allowed for an inoperable train of AFW, i.e., 72 hours to restore, 6 hours to be in MODE 3 and 18 hours to be in MODE 4.

Changing MODEs when LCO 3.7.5 was not met, and exceeding the time allowed for an inoperable AFW train were determined to be reportable as a condition prohibited by Technical Specifications in accordance with WBN License Condition 2.G.

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

Misalignment of the governor valve stem linkage caused the actuator to stick or bind, such that the TDAFW pump speed could not be controlled in either manual or automatic mode.

## C. Dates and Approximate Times of Major Occurrences

Date	Time (EST)	Event
05/14/2011	14:28	Enter Mode 3.
05/16/2011	04:56	Initiated 1-SI-3-92-S to perform SR 3.7.5.2 with SG pressure at approximately 1076 psig.
05/16/2011	20:13	Enter LCO 3.7.5, Condition B, due to failure to meet SR 3.7.5.2.
05/19/2011	17:45	1-SI-3-923-S completed, acceptance criteria met, exited LCO 3.7.5, Condition B.

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## II. DESCRIPTION OF EVENT (continued):

## D. Other Systems or Secondary Functions Affected

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

## E. Method of Discovery

Performance of Surveillance Instruction (SI) 1-SI-3-923-S, Auxiliary Feedwater Pump 1A-S Comprehensive Pump Test.

## F. Operator Actions

After failure to meet SR 3.7.5.2 acceptance criteria, the operator secured the TDAFW pump and entered LCO 3.7.5, Condition B, One AFW train inoperable in Modes 1, 2, or 3 for reasons other than Condition A.

## G. Safety System Responses

Although the TDAFW pump was inoperable, steam generator (SG) level for all four SGs was maintained by two independent and physically separate motor driven AFW pumps.

## III. CAUSE OF EVENT

The Terry Turbine speed control system consists of the EGM (Electronic Governor- Magnetic Pickup), EGR (Electronic Governor- Remote) and actuator. The EGM compares the analog speed demand signal from the pump flow controller to the actual turbine speed to generate a speed error signal. The EGR is a remote servo that converts the analog speed error signal from the EGM to a hydraulic signal which is then transmitted to the actuator. The actuator converts hydraulic oil pressure into mechanical motion. The actuator is a hydraulic cylinder with the cylinder piston connected to a control arm (valve stem linkage) that pivots on a fulcrum to allow the control arm to position the governor valve stem. The governor valve stem positions the governor valve to regulate steam flow and thereby turbine speed. Pump discharge flow is dependent on the AFW system flow resistance, SG pressure and pump developed head. Misalignment of the mechanical linkage between the actuator and the governor valve stem caused the actuator to stick or bind such that turbine speed could not be controlled in a manner required to perform 1-SI-3-923-S.

## IV. ANALYSIS OF THE EVENT

Misalignment of the valve stem linkage was not detected when the new servo (EGR) and actuator were installed during WBN Cycle 10 refueling outage. Installation was done in accordance with vendor instruction manuals. However, a complete post modification testing (PMT) could not be performed to verify operability because SG pressure was not sufficiently high enough to place the turbine in-service. Sufficient SG pressure is not available until after the plant enters Mode 3. After entering Mode 3 with SG pressure at approximately 1076 psig, the TDAFW pump was started in the automatic mode to perform SR 3.7.5.2. Performing the test at 1076 psig is conservative because it results in lower pump developed head. The turbine ran up to the rated high speed of 3950 rpm and maintained speed. Afterwards, the turbine speed controller was placed in manual mode in order to reduce turbine speed to 3600 rpm. Turbine speed is reduced to 3600 rpm to avoid excessive vibration in the pump recirc line due to resonant frequency at low flow. After speed control was transferred to manual, the operators could not reduce speed to 3600 rpm to perform surveillance testing. This was the first indication that the governor was inoperable. After several attempts, the operators secured the TDAFW pump, entered LCO 3.7.5, Condition B, and then proceeded to trouble shoot and make repairs. The valve stem linkage was realigned and SR 3.7.5.2 repeated. The TDAFW pump passed SR 3.7.5.2 acceptance criteria within the allowable Completion Time of 72 hours. Upon satisfactory completion of SR 3.7.5.2, the plant exited LCO 3.7.5.

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**IV. ANALYSIS OF EVENT (continued)**

SR 3.7.5.2 is modified by a Note indicating that this SR should be performed 24 hours after SG pressure is greater than or equal to 1092 psig. This SR Note was used by the plant to perform PMT following TDAFW repairs.

**V. ASSESSMENT OF SAFETY CONSEQUENCES**

The condition identified in this report would not have resulted in loss of design bases safety functions requiring AFW support. Both Trains A and B AFW motor driven pumps were capable of performing their design bases functions during the conditions that existed while the TDAFW pump was inoperable. The AFW system would also have fulfilled its design bases functions if there had been a loss of Train A or Train B. Consequently the WBN accident analysis would not have been adversely impacted by this condition.

**VI. CORRECTIVE ACTIONS****A. Immediate Corrective Actions**

1. Entered LCO 3.7.5, Condition B, due to failure to meet SR 3.7.5.2.
2. Secured TDAFW pump in order to make repairs to turbine governor.
3. Performed SR 3.7.5.2. TDAFW pump met acceptance criteria.
4. Exited LCO 3.7.5

**B. Corrective Actions to Prevent Recurrence**

1. Revise Maintenance Instruction MI-1.003, Disassembly, Inspection, and Reassembly of Auxiliary Feedwater Pump Turbine, to provide maintenance explicit instructions on how to align the mechanical linkage between the actuator and the governor valve stem.
2. Submit a license amendment that would allow a 7 day Completion Time for the turbine-driven AFW pump if the inoperability occurs in MODE 3. This change will reduce the number of unnecessary MODE changes by providing added flexibility in MODE 3 to repair and test the turbine-driven AFW pump following a refueling outage.

**VII. ADDITIONAL INFORMATION****A. Failed Components**

Valve actuator within the turbine speed control system.

**B. Previous LERs on Similar Events**

A search of LERs and PERs documenting misalignment of the TDAFW pump governor at Watts Bar Unit 1 found no previous failures similar to that which occurred on 5/16/11.

**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**

None.

**VIII. COMMITMENTS**

None