



Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

July 29, 2011

10 CFR 50.73

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

Browns Ferry Nuclear Plant, Unit 3
Facility Operating License No. DPR-68
NRC Docket No. 50-296

Subject: Licensee Event Report 50-296/2009-003-03

On May 24, 2010, the Tennessee Valley Authority (TVA) submitted Revision 0 to Licensee Event Report (LER) 50-296/2009-003 which contained a commitment to provide additional details of the condition prohibited by Technical Specifications involving an inoperable Reactor Core Isolation Cooling System. Revision 1 to the LER was submitted July 15, 2010, and indicated a supplemental report was expected. On August 31, 2010, TVA submitted Revision 2 to the LER which contained an expanded timeline and additional data.

As stated in TVA letter dated July 5, 2011, this revision of the LER is being submitted by July 29, 2011.

There are no new regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact J. E. Emens, Jr., Nuclear Site Licensing Manager, at (256) 729-2636.

Respectfully,

K. J. Polson
Vice President

Enclosure: Licensee Event Report - Reactor Core Isolation Cooling System Inoperable
Longer Than Allowed by the Technical Specifications

cc (w/ Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

IT22
HRR

Enclosure

**Browns Ferry Nuclear Plant
Unit 3**

**Licensee Event Report - Reactor Core Isolation Cooling System Inoperable Longer Than
Allowed by the Technical Specifications**

SEE ATTACHED

LICENSEE EVENT REPORT (LER)

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 FOIA/Privacy Section (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.

1. FACILITY NAME Browns Ferry Nuclear Plant Unit 3	2. DOCKET NUMBER 05000296	3. PAGE 1 of 9
--	-------------------------------------	--------------------------

4. TITLE: Reactor Core Isolation Cooling System Inoperable Longer Than Allowed by the Technical Specifications

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
03	22	2006	2009	003	03	07	29	2011	N/A	05000
									FACILITY NAME	DOCKET NUMBER
									N/A	05000

9. OPERATING MODE 2	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: <i>(Check all that apply)</i>																																				
10. POWER LEVEL 000	<table style="width:100%; border: none;"> <tr> <td><input type="checkbox"/> 20.2201(b)</td> <td><input type="checkbox"/> 20.2203(a)(3)(i)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(C)</td> <td><input type="checkbox"/> 50.73(a)(2)(vii)</td> </tr> <tr> <td><input type="checkbox"/> 20.2201(d)</td> <td><input type="checkbox"/> 20.2203(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(1)</td> <td><input type="checkbox"/> 20.2203(a)(4)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(B)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(i)</td> <td><input type="checkbox"/> 50.36(c)(1)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ix)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(ii)</td> <td><input type="checkbox"/> 50.36(c)(1)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iv)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(x)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iii)</td> <td><input type="checkbox"/> 50.36(c)(2)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(A)</td> <td><input type="checkbox"/> 73.71(a)(4)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iv)</td> <td><input type="checkbox"/> 50.46(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(B)</td> <td><input type="checkbox"/> 73.71(a)(5)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(v)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(C)</td> <td><input type="checkbox"/> OTHER</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(vi)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(D)</td> <td style="font-size: small;">Specify in Abstract below or in NRC Form 368A</td> </tr> </table>	<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 type="checkbox"/> OTHER	<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)(v)(D)	Specify in Abstract below or in NRC Form 368A
<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 type="checkbox"/> OTHER																																		
<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)(v)(D)	Specify in Abstract below or in NRC Form 368A																																		

12. LICENSEE CONTACT FOR THIS LER

Facility Name Eric Bates, Licensing Engineer	TELEPHONE NUMBER (Include Area Code) 256-614-7180
---	--

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	BN	65	W290	Y					

14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE						
	<table style="width:100%; border: none;"> <tr> <td style="width:33%;">MONTH</td> <td style="width:33%;">DAY</td> <td style="width:33%;">YEAR</td> </tr> <tr> <td style="text-align: center;">NA</td> <td style="text-align: center;">NA</td> <td style="text-align: center;">NA</td> </tr> </table>	MONTH	DAY	YEAR	NA	NA	NA
MONTH	DAY	YEAR					
NA	NA	NA					

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

On February 13, 2007, and again on August 26, 2009, during post-scrum reviews, Browns Ferry Nuclear Plant personnel identified an unexpected level of instability in the Reactor Core Isolation Cooling (RCIC) system flow and turbine response following reactor scrams that occurred on February 9, 2007, and on August 24, 2009. Following each event, site engineering personnel reviewed the RCIC response and concluded the RCIC system was capable of performing its design function and Operations determined that RCIC was operable. On February 12, 2007, and again on August 26, 2009, Unit 3 entered Mode 2, commencing startup operations. Following the second event on August 24, 2009, Unit 3 was returned to service and remained at power until September 12, 2009, when Unit 3 was removed from service for scheduled maintenance activities. During the September 2009 outage, the RCIC Electric Governor-Remote (EG-R) was replaced and successfully tested. On March 25, 2010, in response to questions from the Nuclear Regulatory Commission (NRC), the Tennessee Valley Authority notified the NRC via a conference telephone call that Unit 3 RCIC was inoperable since March 22, 2006, after the EG-R had been installed and when Unit 3 exceeded 150 psig while in Mode 2. This reflected RCIC inoperability longer than allowed by Technical Specification 3.5.3 and mode changes not allowed by LCO 3.0.4. A failure analysis, conducted by Engine Systems Incorporated, determined the oscillations were caused by a missing buffer piston and springs within the EG-R.

(10-2010)

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2009	-- 003	-- 03	2 of 9

NARRATIVE**I. PLANT CONDITION(S)**

On March 25, 2010, Tennessee Valley Authority (TVA) determined that the Reactor Core Isolation Cooling [BN] (RCIC) system had been previously inoperable. The inoperability event date was March 22, 2006. On March 22, 2006, Unit 1 was shutdown, Unit 2 was at 100 percent power, and Unit 3 was in Mode 2, commencing restart activities.

II. DESCRIPTION OF EVENT**A. Event**

On March 14, 2006, during Unit 3 refueling outage 12, Browns Ferry Nuclear Plant (BFN) installed a replacement Electric Governor-Remote (EG-R) on the RCIC system as a scheduled preventative maintenance activity. Post-maintenance surveillance testing was satisfactorily completed using Condensate Storage Tank (CST) to CST test mode. On March 22, 2006, Unit 3 exceeded 150 psig while in Mode 2 commencing restart operations.

On February 9, 2007, Unit 3 received an automatic reactor scram from 100 percent power following a loss of condensate flow. RCIC auto-initiated and injected into the reactor vessel in response to the low water level resulting from the loss of condensate flow. On February 12, 2007, Operations personnel commenced restart operations with Unit 3 entering Mode 2. Specific details on the reactor scram can be found in LER 50-296/2007-001, Reactor Scram due to Low Reactor Water Level Caused by Loss of Feedwater, submitted to the Nuclear Regulatory Commission (NRC) on April 10, 2007.

On February 13, 2007, a post-scram review of the RCIC operating parameters revealed the unexpected level of instability in the system flow and turbine control system response that was experienced on February 9, 2007. During the injection sequence, RCIC system flow oscillated between approximately 300 gallons per minute (gpm) and 900 gpm. However, because the RCIC system only operated approximately 2 minutes and automatically shut down when the Reactor Pressure Vessel (RPV) high water level was attained, the instability was not noted by the Operations crew; therefore, no review of the system response was conducted prior to the startup of Unit 3. On February 15, 2007, a functional evaluation concluded that the RCIC system was capable of performing its design function. As part of the troubleshooting for the observed oscillations, maintenance was performed on a control system wiring terminal lug. However, the post-maintenance testing was conducted using the routine quarterly surveillance procedure which operated RCIC in a CST recirculation mode, rather than aligned for RPV injection. Since no RCIC oscillations were identified during the post-maintenance test, it was concluded that the flow oscillation problem had been corrected.

On March 18, 2008, Unit 3 entered refueling outage 13. During the refueling outage, the EG-R needle valve was adjusted and the turbine governor valve was replaced. However, the post-maintenance testing was conducted using the routine quarterly

(10-2010)

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2009	-- 003	-- 03	3 of 9

NARRATIVE

surveillance procedure which operated RCIC in a CST recirculation mode, rather than aligned for RPV injection. Since no RCIC oscillations were identified during the post-maintenance test, it was concluded that the flow oscillation problem had been corrected. On May 15, 2008, following the completion of outage activities, Operations commenced restart activities for Unit 3 Cycle 14 operation, entering Mode 2.

On August 24, 2009, Unit 3 was manually scrammed from 100 percent power due to the lowering of the water level in the RPV. Following the manual reactor scram, RCIC auto initiated and injected into the reactor vessel. On August 26, 2009, Operations personnel commenced startup operations with Unit 3 entering Mode 2. Unit 3 was returned to service on August 28, 2009, and remained at power until September 12, 2009. Specific details of the Unit 3 manual reactor scram can be found in LER 50-296/2009-001, Reactor Scram Due to Loss of Condensate Booster Pumps, submitted to the NRC on October 23, 2009.

On August 26, 2009, as part of a post-scram review and prior to restart, site engineering personnel again identified an unexpected level of instability in the RCIC system flow and turbine response. During the injection sequence, the RCIC system flow oscillated between approximately 230 gpm and 970 gpm. A functional evaluation dated August 26, 2009, concluded that the RCIC system was capable of performing its design function and Operations determined the RCIC system was operable.

Following each event, BFN Engineering personnel evaluated the RCIC system response, concluded the RCIC system was capable of performing its design function and Operations determined that the RCIC system was operable.

EG-R needle valve adjustments were made immediately prior to the Unit 3 shutdown in September 2009. The subsequent testing was inconclusive due to the Amphenol disconnection that occurred during testing. On September 12, 2009, Unit 3 was removed from service for scheduled maintenance activities not associated with the RCIC system. During the September 2009 maintenance outage, the RCIC EG-R was replaced and successfully tested. A failure analysis of the removed EG-R, conducted by ESI, determined the oscillations were caused by a missing buffer piston and springs within the EG-R.

On March 25, 2010, in response to questions from the NRC, TVA notified the NRC via a telephone conference call that the RCIC system was inoperable since Unit 3 exceeded 150 psig while in Mode 2 on March 22, 2006, based on reevaluation of the impact of the non-conforming EG-R. Technical Specification (TS) 3.5.3 requires that the RCIC pump develop a flow rate greater than or equal to 600 gpm against a system head corresponding to reactor pressure. Operability with respect to the applicable TS requirements could not be concluded as a result of the observed instability.

TVA has determined the RCIC system was inoperable from March 22, 2006, to September 12, 2009. This time period represents Unit 3 entering Mode 2 after installation of the EG-R to Unit 3 shutting down entering Mode 4 replacing the defective

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2009	-- 003	-- 03	4 of 9

NARRATIVE

EG-R. March 25, 2010, was the determination date for the past inoperability of the RCIC system.

TVA is submitting this report in accordance with 10 CFR 50.73(a)(2)(i)(B), as an operation or condition prohibited by the plant's Technical Specifications.

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

None

C. Dates and Approximate Times of Major Occurrences

March 14, 2006	BFN installs replacement EG-R and it is successfully tested.
March 22, 2006	Unit 3 enters Mode 2, commencing restart activities.
February 9, 2007	Unit 3 received an automatic reactor scram. RCIC pump starts and injects into the reactor vessel on low water level.
February 12, 2007	Unit 3 enters Mode 2, commencing restart activities.
February 13, 2007	BFN personnel noted an unexpected level of instability during RPV injection on February 9, 2007.
March 18 thru May 15, 2008	BFN conducts Unit 3 Refueling Outage 13.
August 24, 2009	Unit 3 Operations personnel insert a manual scram on Unit 3. RCIC pump starts and injects into the reactor vessel on low water level.
August 26, 2009	BFN personnel noted an unexpected level of instability during RPV RCIC injection on August 24, 2009.
August 26, 2009	BFN Operations personnel commenced restart activities on Unit 3 by placing the mode switch in Startup position.
September 12, 2009	Unit 3 shut down for scheduled maintenance activities.
September 14, 2009	RCIC EG-R replaced.
September 21, 2009	RCIC system successfully tested using RPV injection.
March 25, 2010	TVA informs NRC that RCIC was inoperable longer than allowed by TS.

(10-2010)

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2009	-- 003	-- 03	5 of 9

NARRATIVE**D. Other Systems or Secondary Functions Affected**

None

E. Method of Discovery

BFN personnel noted the instability in RCIC system operation during post-scrum reviews of the RCIC system operating parameters.

F. Operator Actions

None

G. Safety System Responses

None

III. CAUSE OF THE EVENT**A. Immediate Cause**

The immediate cause for the inoperable RCIC pump was the EG-R actuator non-conformance and the resulting reduced stability of the RCIC governor control system during RPV injection. The EG-R was absent critical parts that would keep the RCIC pump from oscillating during RPV injection.

B. Root Cause

A failure analysis, performed by Engine Systems Incorporated (ESI), determined the oscillations observed during RPV injection were caused by a missing buffer piston and springs within the EG-R. However, the missing parts did not affect stable operation during the periodic surveillance testing, and therefore, inoperability was not detectable by routine surveillance testing of the RCIC system. Therefore, inoperability of the RCIC system was caused by omission of critical parts in the EG-R actuator during original manufacturing or during vendor repairs. Based on the failure analysis performed by ESI, this was considered an isolated occurrence.

C. Contributing Factors

None

IV. ANALYSIS OF THE EVENT

On February 9, 2007, and again on August 24, 2009, following the Unit 3 reactor scram, the RCIC system, along with the High Pressure Coolant Injection [BJ] (HPCI) system, auto-initiated and injected into the RPV restoring water level. Both the HPCI and the RCIC systems auto-stopped as expected on high RPV water level.

Subsequent review of the RCIC System operating flow parameters for both scrams revealed an unexpected level of instability in the RCIC system flow and turbine control system response. In both cases, the instability was not noted by the BFN Operations personnel in

(10-2010)

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2009	-- 003	-- 03	6 of 9

NARRATIVE

the main control room due to the short time the system operated (approximately 2.0 and 2.5 minutes respectively). With regard to the oscillations that occurred on February 9, 2007, a review of RCIC system operation was not conducted prior to Unit 3 restart. The troubleshooting activities noted in the description of the February 2007 event above were ineffective as corrective actions because they did not address the root cause, i.e., the missing buffer piston and springs within the EG-R. The post-maintenance test method used did not inject into the RPV, and therefore did not replicate actual system pressure conditions which induced the oscillations allowed by the missing EG-R components during the February 2007 RCIC injection. Thus, the corrective actions taken in 2007 did not prevent recurrence of flow oscillations.

The following discussion is specific to the August 24, 2009, event; however, the data is consistent with data from the event that occurred on February 9, 2007. During the injection event on August 24, 2009, flow data obtained from a high resolution source (100 samples per second from the plant Integrated Computer System [ID] (ICS)) indicated RCIC pump output flow was oscillating between 230 gpm and 970 gpm. A least-squares fit analysis of this event indicated that the RCIC system was providing an average flow rate of approximately 620 gpm.

The highest recorded speed of the turbine was 4610 RPM which is well below the over-speed setpoint of 5625 RPM. Therefore, while the turbine speed was oscillating, the turbine did not approach the over-speed setpoint.

Another flow rate estimate was performed using a flow totalization method. The evaluation used high speed data (Dataware Program) to estimate the total injection during the 2 minute 29 second time period. The total volume obtained was 1573 gallons, which corresponded to 630 gpm during the injection period. A similar flow totalization estimate was performed using high resolution ICS data. This estimate calculated an average flow rate of approximately 623 gpm during the injection period.

Normal RCIC system flow testing is performed taking suction from the condensate header and discharging back to the CST. During the RCIC system testing activities, perturbations are introduced into the control system by operating the system with the flow controller in the manual mode and then placing the controller in the automatic mode with a flow setpoint different than the existing system flow rate. This method limits the severity of the perturbation. Additionally, due to the hydraulic difference between the CST to CST mode of operation and injection into a pressurized RPV, the instability on the Unit 3 governor control system during RPV injection was not detected until the RPV injection occurred.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The safety consequences of this event were not significant.

The applicability statement for BFN TS Limiting Condition for Operation 3.5.3 requires the RCIC system be operable when the reactor is in Mode 1 and in Modes 2 and 3 with the reactor dome pressure greater than 150 psig. TS 3.5.3 Condition A and Required Actions

(10-2010)

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2009	-- 003	-- 03	7 of 9

NARRATIVE

A.1 and A.2 require immediate verification by administrative means that the HPCI system is operable and restoration of the RCIC system to operable status in 14 days. These Required Actions were not met. The extended period of RCIC system inoperability without verification of HPCI system operability constituted a condition prohibited by TS 3.5.3; had the condition been known, a unit shutdown would have been required by the TS. Mode changes prohibited by TS 3.0.4 were also made. During the time that the RCIC system was inoperable, the HPCI system was inoperable for short periods at three different occasions which are discussed below.

- On November 30, 2007, between approximately 1052 and 1435 hours Central Standard Time, during a controlled reactor shutdown, Unit 3 HPCI system was declared inoperable when a steam leak on a HPCI system condensate inboard drain valve increased. Details on the HPCI system inoperability can be found in LER 50-296/2007-004, Manual Isolation of High Pressure Coolant Injection Due to a Steam Leak, submitted to the NRC on January 28, 2008.
- On July 24, 2007, at 1645 hours Central Daylight Time (CDT), the Unit 3 HPCI system was declared inoperable when the Division II Emergency Core Cooling Systems [AD] Analog Trip Unit Inverter [EJ] failed due to a cleared fuse. On July 25, 2007, at approximately 0105 hours CDT, the HPCI system was declared operable. Details on the HPCI system inoperability can be found in LER 50-296/2007-002, Unplanned Inoperability of the Unit 3 High Pressure Coolant Injection System Due to Loss of 120 V-AC Instrument Power, submitted to the NRC on September 24, 2007.
- There was approximately 6.58 hours of Maintenance Rule unplanned unavailability for the HPCI system during the period from March of 2006 thru September of 2009. Additional planned unavailability of the HPCI system occurred during the performance of surveillance tests and other maintenance activities. However, these instances would typically be less than a shift in duration.

To be considered operable in accordance with the applicable TS requirements, the RCIC system is assumed to deliver a minimum of 600 gpm to the RPV. Although the RCIC system was inoperable, during the period discussed in this LER, it was functional. That is, the RCIC system was capable of starting and injecting into the RPV delivering an average flow rate greater than or equal to 600 gpm to the RPV. During the RPV injection on February 9, 2007, and again on August 24, 2009, the RCIC system along with the HPCI system injected for approximately 2.0 and 2.5 minutes and injected an average of approximately 620 gpm for the period. For long term operation such as maintaining water level with the RPV isolated, Operating Instruction 3-OI-71, "Reactor Core Isolation Cooling System," provides instructions for operating the RCIC system in a manual mode upon malfunction of the flow controller. Therefore, TVA concludes that there was no significant reduction in the health and safety of the public by this event.

(10-2010)

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2009	-- 003	-- 03	8 of 9

NARRATIVE

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

On September 14, 2009, BFN replaced the Unit 3 RCIC system EG-R. Following the replacement of the Unit 3 RCIC system EG-R, a RPV injection test was conducted on September 21, 2009. The EG-R exhibited stable RCIC turbine speed and flow during the RPV injection. The EG-R that was in place during the period was sent to the vendor for failure analysis and refurbishment.

B. Corrective Actions

Safety related systems were reviewed for their flow setpoints specified in their respective Nuclear Engineering Setpoint and Scaling Documents relative to the TS limits. HPCI and RCIC were the only systems that were revised which had TS limits that coincided with their safety related setpoint.

C. Corrective Actions to Prevent Recurrence

The current vendor, ESI (used by TVA for dedication of the EG-R), is not the vendor that dedicated the failed EG-R for use at BFN. TVA relies on ESI to provide a fully dedicated EG-R for use at BFN. Implementation of the vendor's Appendix B Quality Assurance Program is expected to provide TVA with a fully dedicated EG-R and prevent the recurrence of this event. All new governors and/or actuators are subject to retesting while at ESI using the same test specifications as the manufacturer.

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

The failed component was the EG-R. The EG-R, serial number 12047729, was sold new by Woodward Governor Company to Dresser-Rand in March 1998. Dresser-Rand dedicated the EG-R for use on Unit 3. Woodward Governor Company records show that it was returned in April 1998 for warranty by Dresser-Rand. Woodward returned the EG-R to Dresser-Rand after correcting a warranty issue. There have not been any other EG-R returns to Woodward Governor Company or ESI with this serial number.

B. Previous LERs or Similar Events

A previous similar event occurred on the Standby Gas Treatment [BH] (SGT) Train. An equipment issue associated with one of the three SGT Train's relative humidity heater power loss alarms was misdiagnosed by Operations, Maintenance, and Systems Engineering. Operations failed to initiate a Problem Evaluation Report (PER) when the problem was first identified and did not pursue timely and accurate evaluation and correction of this equipment issue. As a result, SGT Train A was declared inoperable approximately 5 months later.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
Browns Ferry Nuclear Plant Unit 3	05000296	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	9 of 9
		2009	-- 003	-- 03	

NARRATIVE

C. Additional Information

Corrective action documents associated with this event are PERs 119628, 200183, 224614, 232668, and 246526. PER 246527 was generated to address the incomplete and inaccurate information provided in Revision 0 to this LER. PERs 304722 and 329704 were generated to address the incomplete and inaccurate information provided in Revision 2 to this LER.

D. Safety System Functional Failure Consideration

This event is not classified as a safety system functional failure according to NEI 99-02.

E. Scram With Complications Consideration

This LER does not describe a complicated scram according to NEI 99-02.

VIII. COMMITMENTS

None