



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
245 PEACHTREE CENTER AVENUE NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

November 8, 2010

Mr. R. M. Krich  
Vice President, Nuclear Licensing  
Tennessee Valley Authority  
3R Lookout Place  
1101 Market Street  
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT - NRC PROBLEM IDENTIFICATION AND  
RESOLUTION INSPECTION REPORT 05000259/2010006, 05000260/2010006  
AND 05000296/2010006

Dear Mr. Krich:

On September 24, 2010, the U. S. Nuclear Regulatory Commission (NRC) completed a team inspection at your Browns Ferry Nuclear Plant, Units 1, 2 and 3. The enclosed inspection report documents the inspection results, which were discussed on September 24, 2010, with you and other members of the Browns Ferry Nuclear Plant staff.

The inspection was an examination of activities conducted under your licenses as they relate to the identification and resolution of problems, compliance with the Commission's rules and regulations and with the conditions of your operating licenses. Within these areas, the inspection involved examination of selected procedures and representative records, observations of plant equipment and activities, and interviews conducted with station personnel.

On the basis of the samples selected for review, the team concluded that in general, problems were being properly identified, evaluated, and resolved within the problem identification and resolution programs. However, the team identified examples of issues not being entered into the corrective action program as well as some weaknesses in the evaluation and trending of issues entered into the corrective action program. It was recognized that management has placed additional attention on the corrective action program and has initiated wide-spread and substantive actions to improve performance in this area since the last PI&R inspection conducted in July of 2009.

This report documents six findings of very low safety significance (Green) of which five were determined to involve a violation of NRC requirements. However, because of the very low safety significance and because they were entered into your corrective action program, the NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the NRC's Enforcement Policy. The sixth issue is documented as a finding because you did not follow your programs and procedures. If you contest any NCV or finding in this report you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk Washington DC 20555-0001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001;

and the NRC Senior Resident Inspector at the Browns Ferry Nuclear Plant. In addition, if you disagree with the crosscutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, RII, and the NRC Senior Resident Inspector at Browns Ferry.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Web-site at <http://www.nrc.gov/readingrm/adams.html> (the Public Electronic Reading Room).

Sincerely,

*/RA/*

George T. Hopper, Chief  
Reactor Projects Branch 7  
Division of Reactor Projects

Docket Nos.: 50-259, 50-260, 50-296, 72-052  
License Nos.: DPR-33, DPR-52, DPR-68

Enclosure: Inspection Report 05000259/2010006, 05000260/2010006, and  
05000296/2010006  
w/Attachment: Supplemental Information

cc w/encl. (See page 3)

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Letter to R. M. Krich from George T. Hopper dated November 8, 2010

SUBJECT: BROWNS FERRY NUCLEAR PLANT - NRC PROBLEM IDENTIFICATION AND  
RESOLUTION INSPECTION REPORT 05000259/2010006, 05000260/2010006  
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**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket Nos.: 50-259, 50-260, 50-296, 72-052

License Nos.: DPR-33, DPR-52, DPR-68

Report No.: 05000259/2010006, 05000260/2010006, and  
05000296/2010006

Licensee: Tennessee Valley Authority (TVA)

Facility: Browns Ferry Nuclear Plant, Units 1, 2, and 3

Location: Corner of Shaw and Nuclear Plant Roads  
Athens, AL 35611

Dates: August 30 – September 3, 2010  
September 20 – 24, 2010

Inspectors: A. Sabisch, Senior Resident Inspector  
P. O'Bryan, Senior Resident Inspector  
P. Higgins, Senior Project Engineer  
M. Barillas, Resident Inspector

Approved by: George T. Hopper, Chief  
Reactor Projects Branch 7  
Division of Reactor Projects

Enclosure

## SUMMARY OF FINDINGS

IR 05000259/2010006, 05000260/2010006, 05000296/2010006; 8/30/2010 – 9/24/2010;  
Browns Ferry Nuclear Plant, Units 1, 2 and 3; Identification and Resolution of Problems

The inspection was conducted by two Senior Resident Inspectors, a Resident Inspector and a Senior Project Engineer. Six findings of very low safety significance (Green) were identified during this inspection. The significance of most findings is identified by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Cross-cutting aspects are determined using IMC 0310, "Components Within The Cross-Cutting Areas." Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process" Revision 4, dated December 2006.

### Problem Identification and Resolution

The team concluded that the licensee was generally effective in identifying problems at a low threshold and entering them into the corrective action program. The licensee properly prioritized issues entered into the corrective action program (CAP) and generally performed evaluations that were technically accurate and of sufficient depth to address the issue documented in the Service Requests (SRs) or Problem Evaluation Requests (PERs) although some weaknesses were identified by the inspection team. Licensee management has provided increased focus and attention on the quality of root cause and apparent cause determinations based on the results of internal self assessments and external audits and inspections. Improvements were noted in the overall quality of the documents produced over the last six months from the implementation of the new service request program. Operating experience was found to be used both proactively and reactively by personnel involved in the corrective action program. The licensee's programmatic self-assessments and audits were generally effective in identifying weaknesses in the corrective action program and developing corrective actions to address these weaknesses. The inspectors concluded that the workers at Browns Ferry felt free to report safety concerns. However, the team identified examples of issues not being entered into the corrective action program as well as some weaknesses in the evaluation and trending of issues entered into the corrective action program. It was recognized that management has placed additional attention on the corrective action program and has initiated wide-spread and substantive actions to improve performance in this area since the last PI&R inspection conducted in July of 2009.

### Cornerstone: Initiating Events

- Green: The inspectors identified a finding for the licensee's failure to implement the applicable provisions of the Tennessee Valley Authority (TVA) Preventative Maintenance (PM) Program to replace the coil in the solenoid valve controlling the opening of the Unit 3 Condensate Demineralizer bypass valve on the specified PM frequency. Failure of this coil was identified as a contributing cause in Root Cause Analysis for PER 200203, "Unit 3 Manual Scram Due to Lowering Reactor Water Level." This finding was entered into the licensee's corrective action program as PER 245390.

The inspectors determined that the licensee's failure to implement the TVA PM program was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Initiating Events cornerstone attribute of Equipment Performance, and adversely affected the cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during at power operations, since failure to implement the provisions of the PM program increased the likelihood of a component failure which contributed to a plant transient. Specifically the failure of the solenoid coil contributed to a reactor trip. The inspectors determined that the finding was of very low safety significance because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigating equipment or functions were not available. The inspectors determined that this finding directly involved the cross-cutting area of Human Performance, component of Work Practices and aspect of Procedural Compliance because licensee personnel failed to follow the guidance contained in the Preventive Maintenance program resulting in a plant transient. [H.4.b] (Section 4OA2.a.3.2)

#### Cornerstone: Mitigating Systems

- Green: The inspectors identified a non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for the licensee's failure to adequately evaluate and take prompt corrective actions to address a condition adverse to quality related to two Emergency Equipment Cooling Water (EECW) system flow control valves determined to have been throttled below the analyzed 0.125 inch gap for a period of approximately three months. This condition restricted the flow to the cooler due to flow blockage which could have resulted in inoperability of the downstream safety-related Core Spray (CS) pump room heat exchangers. This finding was entered into the licensee's corrective action program as PER 257029.

The inspectors determined that the licensee's failure to promptly address an identified deficiency associated with safety related equipment was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affects the cornerstone objective to ensure the availability, reliability, and capability of the Core Spray system to respond to initiating events to prevent undesirable consequences; (i.e., core damage), since it resulted in 2 valves in the core spray system remaining throttled below their analyzed seat to disc clearance for several months after the licensee became aware of this condition, thus subjecting these valves to an increased likelihood of clogging with debris and affecting the reliability of the system.

The inspectors determined that the finding was of very low safety significance because the finding was not a design deficiency, did not result in an actual loss of system or single train function, and was not potentially risk significant due to external events. The inspectors determined that this finding directly involved the cross-cutting area of Problem Identification and Resolution, component of the Corrective Action Program and aspect of Through Evaluation of Identified Problems because the licensee did not perform a thorough evaluation of identified problems such that the resolutions address causes and extent of conditions. [P.1(c)] (Section 4OA2.a.3.1)

- Green: The inspectors identified a non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for the licensee's failure to correct a condition adverse to quality by

failing to implement adequate corrective actions to address degradation in the performance of the 2D RHR room cooler. On July 17, 2009, the 2D RHR room cooler thermal overload failed due to high mechanical vibrations, which the licensee failed to identify and correct prior to a subsequent failure on August 19, 2009. This finding was entered into the licensee's corrective action program as PER 261728.

The inspectors determined that the licensee's failure to implement adequate corrective actions after the 2D RHR motor trip on July 17, 2009 was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems Cornerstone in that it adversely affected the reliability of the 2D RHR room cooler to respond to initiating events. The inspectors determined that the finding was of very low safety significance because it did not result in inoperability of a safety function for greater than the allowed technical specification outage time. The inspectors determined that this finding directly involved the cross-cutting area of Problem Identification and Resolution, component of the Corrective Action Program and aspect of Appropriate and Timely Corrective Actions because the licensee did not implement appropriate and timely corrective actions to resolve a condition adverse to quality. Specifically, the problem with the 2D RHR room cooler was not adequately addressed after the motor trip on July 17, 2009. [P.1 (d)] (Section 4OA2.a.3.3)

- Green: The inspectors identified a non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for the licensee's failure to correct a condition adverse to quality and implement adequate corrective actions for the degraded 1B Core Spray (CS) room cooler. The licensee failed to implement adequate correct actions to address the inability of the room cooler perform its design function with degraded cooling water flow prior to its loss of function on June 25, 2010. The licensee has since replaced the cooler in order to provide additional flow margin.

The failure to take adequate corrective actions to address the potential high river temperature along with degraded heat exchanger flow was a performance deficiency. The performance deficiency was more than minor because it is associated with the Equipment Performance attribute of the Mitigating Systems Cornerstone and adversely affected the availability of the 1B CS room cooler to respond to initiating events. The inspectors determined that a Phase 2 screening was required because the 1B division of core spray was inoperable for greater than the 7 day technical specification allowed out of service time. Using the pre-solved Phase Two significance determination worksheet, the inspectors determined that the finding was of very low safety significance. The inspectors determined that this finding directly involved the cross-cutting area of Problem Identification and Resolution, component of the Corrective Action Program and aspect of Appropriate and Timely Corrective Actions because the licensee did not implement appropriate and timely corrective actions to resolve a condition adverse to quality. Specifically, the licensee failed to address the debris fouling of the 1B CS room cooler prior to its failure on June 25, 2010. [P.1(d)] (Section 4OA2.a.3.4)

- Green: The inspectors identified a non-cited violation of Technical Specification (TS) 5.4.1 for the licensee's failure to have adequate preventative maintenance procedures for Siemens Horizontal Vacuum Circuit Breakers. Plant procedure EPI-0-000-BKR015, 4KV Wyle/Siemens Horizontal Vacuum Circuit Breaker (Type-3AF) and Compartment Maintenance, Revision 28, did not provide specific guidance for checking the tightness of the closing spring charging motor mounting bolts. As a result, on June 15, 2010 while the 3C RHR pump was in service for suppression pool cooling, the charging motor in the pump

breaker cubicle became detached from its mount. The charging spring failed to recharge and the pump would not have restarted if needed following a trip of the circuit breaker. The licensee reattached the charging motor and restored the 3C RHR pump to service. The licensee also revised procedure EPI-0-000-BKR015 to include instructions for ensuring the charging motor was securely fastened to the circuit breaker. This finding was entered into the licensee's corrective action program as PER 234443.

The inspectors determined that the failure to have an adequate maintenance procedure for circuit breaker maintenance was a performance deficiency. This performance deficiency was more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Procedure Quality and adversely affected the cornerstone objective in that the PM procedure for the breaker did not assure the 3C RHR pump could perform its intended safety functions. The inspectors determined that the finding was of very low safety significance because it did not result in inoperability of a safety function for greater than the allowed technical specification outage time and was not potentially risk-significant due to external events. The inspectors determined that this finding directly involved the cross-cutting area of Human Performance, component of Resources and aspect of Complete Documentation because the licensee did not maintain adequate plant procedures for equipment maintenance. Specifically, procedure EPI-0-000-BKR015, Revision 28 did not contain guidance for checking the charging motor bolt tightness resulting in the 3C RHR pump charging motor becoming detached and adversely affecting train operability. [H.2(c)] (Section 4OA2.a.3.6)

- Green: The inspectors identified a self-revealing non-cited violation of Technical Specifications 5.4.1.a, Procedures, for an inadequate surveillance procedure used to test High Pressure Coolant Injection (HPCI) pressure switches that led to an unplanned HPCI system isolation and HPCI system being declared inoperable. This finding was entered into the licensee's corrective action program as PER 239313.

The inspectors determined the failure to establish an adequate procedure used for connecting and disconnecting VOMs during testing of pressure switches on the HPCI system was a performance deficiency. The performance deficiency was more than minor because it affected the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective in that the licensee did not ensure reliability and availability of the HPCI system to respond to initiating events to prevent undesirable consequences. The inspectors determined the finding was of very low safety significance because HPCI was out of service for a total of about 12 hours and did not exceed its TS allowed outage time per TS 3.5.1.c. The inspectors determined that this finding directly involved the cross-cutting area of Human Performance, component of Resources and aspect of Complete Documentation because the licensee failed to provide an adequate procedure to perform the HPCI surveillance test. [H.2(c)] (Section 4OA2.a.3.5)

## REPORT DETAILS

### .4 OTHER ACTIVITIES (OA)

#### 40A2 Problem Identification and Resolution

##### a. Assessment of the Corrective Action Program Effectiveness

###### (1) Inspection Scope

The inspectors reviewed procedures associated with the licensee's CAP which described the administrative process for identifying, evaluating and resolving problems via Service Requests (SR's), Problem Evaluation Reports (PER's) and Work Orders (WO's). The inspectors reviewed selected SRs, PERs and WOs from the approximately 20,000 that had been issued between June 2009 and August 2010. The inspectors also reviewed NRC reports that documented NRC inspections between January 2009 and August 2010 to assess how the licensee addressed findings documented in these reports. Corrective action documents associated with Licensee Event Reports (LERs) were also reviewed to ensure the actions contained in the LERs were appropriate, comprehensive in nature, and had been implemented as stated in the associated SR or PER. For more significant events or issues, the screening of the PER and the associated root cause or apparent cause evaluations were reviewed to determine if they were properly prioritized and received the appropriate level of scrutiny based on the overall risk significance.

The inspectors conducted a detailed review of High Pressure Coolant Injection (HPCI), Residual Heat Removal (RHR), Reactor Core Isolation Cooling (RCIC), Condensate, and Feedwater to verify that problems were being properly identified, appropriately characterized, and processed in accordance with the licensee's established CAP procedures. These systems were selected based on risk insights from the licensee's probabilistic risk analysis as well as their contribution to events that have occurred at the station over the past 12-months as initiators. For these systems and associated components, the inspectors reviewed PERs, system monitoring reports, the maintenance work history, and open Work Orders (WOs). The inspectors conducted plant walkdowns of these systems with the responsible system engineers to assess the overall material condition and to determine if there were any deficiencies that had not been previously identified and entered into the CAP. The inspectors reviewed selected industry and NRC operating experience items associated with plant systems and components to verify that these were appropriately evaluated for applicability and that issues identified were entered into the CAP.

The inspectors reviewed licensee audits and self-assessments, including those which focused on problem identification and resolution programs and processes, to verify that findings were entered into the CAP and to verify that these audits and assessments were consistent with the NRC's assessment of the licensee's CAP. The inspectors attended selected daily Corrective Action Review Board (CARB) and PER Screening Committee (PSC) meetings to observe the management and oversight functions of the CAP.

The inspectors also held discussions with various personnel to evaluate their threshold for identifying issues and entering them into the CAP. Documents reviewed are listed in the Attachment.

(2) Assessment

Effectiveness of Problem Identification

The inspectors determined that the licensee was generally effective at identifying problems and entering them into the CAP, the threshold for initiating SR's was low and employees were encouraged to initiate SRs for issues. The new consolidated reporting program that utilizes SR's to allow issues to be placed into the CAP and then have a focused team determine if the issue should be dispositioned via a PER, WO or both has eliminated the uncertainty that was evident at the time of the last PI&R inspection and had resulted in some issues not being entered into the CAP as required or expected.

The inspectors determined that equipment performance issues were being identified and entered into the CAP for monitoring, follow-up, and resolution. However, the inspectors identified some minor issues that met the criteria set forth in the CAP guidance and had not been captured such as; small oil or water leaks, housekeeping issues, and improper storage of equipment in areas containing safety-related equipment. Some examples noted included the following:

- Chain hoists in RHR heat exchanger rooms not stored properly; SR 243637 initiated
- 2-SHV-74-91, RHR Shutdown Cooling Supply To Fuel Pool Cooling System Shut Off Valve, was leaking approximately 1 drop per minute of oil from the valve gear box; SR 243362 initiated
- 2-RTV-73-201A, HPCI instrument root valve, had a packing leak; SR 243398 initiated
- A ladder improperly secured and leaning against the 2A RHR pump motor; SR 243924 initiated
- Valve 2-SHV-74-87, RHR Pump 2C Minimum Flow Shutoff Valve, was leaking approximately 10 drops per minute of water; SR 243992 initiated

A potential contributor may be the practice of not posting a deficiency tag on the component which forced plant personnel to check the work order system to determine if the condition had been previously identified. Minor issues such as those identified by the team do not appear to receive the same level of attention as more significant issues do, and may go unidentified for periods of time.

Over the past 12 months, station management has enhanced their expectations related to the identification and reporting of issues and communicated these expectations to plant personnel using several methods. As a result, the number of SRs has increased steadily each month since the consolidated process was implemented. Despite the increased number of issues being entered into the CAP, the licensee had been able to maintain the backlog of open SR's below the established target value. The threshold for generating a SR was low and well-defined. Discussions with station personnel revealed that the requirements for generating an SR were understood and were being followed. The inspectors did not identify any informal processes for capturing and tracking issues as had been noted on past inspections. Improved performance in the area of problem

identification was noted by the inspectors since the last PI&R inspection based on a review of the database containing SR's, PER's and WO's, performing walkdowns of the plant, and conducting interviews with station personnel and the Browns Ferry resident inspectors.

#### Effectiveness of Prioritization and Evaluation of Issues

The inspectors determined that generally the licensee adequately prioritized issues that were entered into the CAP through the CARB and PSC functions. Having these focused teams review and establish priorities ensured that the priorities were applied on a consistent basis and in accordance with station and fleet procedures.

Once issues were entered into the CAP and processed by the CARB and PSC, they were assigned to specific groups for evaluation and development of corrective actions. A recent change was to have corrective actions identified within seven days of the issue entered into the CAP rather than the 30 days as stated in the fleet CAP procedure. This has resulted in an increased quality of corrective actions being identified on those SR's which did not require a root cause analysis (RCA) or apparent cause evaluation (ACE) where the specifics of the issue may not be known within the 7-day window. The Closure Review Board, established following the 2009 PI&R inspection, resulted in an improvement in the quality of actions taken to close corrective actions identified through the CAP with the acceptance rate in recent months exceeding 95 percent on a consistent basis.

Since late-2009, station management has provided increased focus on and attention to the quality of RCA's and ACE's based on the results of internal self-assessments and external inspections that documented weaknesses in this area. Based on a review of these documents completed over the last six months, the inspectors recognized an improvement in the overall quality. However, examples were still noted where evaluations were either not technically adequate or lacked sufficient depth to fully address the issues. Some "A" and "B" level PERs had not met fleet or station metrics in terms of the quality of the root cause / apparent cause and recommended corrective actions. Two "A" level PERs, the Yellow violation of 10CFR50, Appendix R requirements and the Substantive Cross Cutting Issue in the PI&R area, required considerable revisions in order to be accepted by the CARB. The licensee developed a "Lessons Learned" document to ensure future RCA's meet fleet procedural requirements and do not require extensive management review and revision prior to being accepted for implementation. The inspection team was not able to assess the effectiveness of this document and associated training due to its development just prior to the start of the inspection.

In addition, some PER's did not contain interim corrective actions to ensure events did not recur while long-term corrective actions were being developed and scheduled for implementation. The inspectors also identified weaknesses in the extent of condition assessments performed on some issues in which the assessments were not broad enough to ensure similar vulnerabilities were identified and adequate interim and/or long-term corrective actions developed. It should be noted that while the inspection team did identify deficiencies in some of the PER's reviewed, the quality of most of the evaluations completed recently has shown marked improvement and can be attributed to the management oversight and mentoring being provided to those performing the actual evaluations. Areas warranting additional focus and attention are related to the

determination of operability, the potential impact of the issue on the design function(s) of the system or component, the ability of the system or component to meet its intended mission time and ensuring the extent of condition aspect of the evaluation has sufficient depth and breadth to address the issue and prevent recurrence. The Findings section below provides examples identified by the inspection team.

### Effectiveness of Corrective Actions

Based on the review of a sample of SR and PER action items and their implementation, the team found, for the most part, that corrective actions developed and implemented for issues were appropriate in scope and commensurate with the safety significance of the issue. The inspection team determined that the licensee's performance in this area continues to improve; however, additional effort is warranted to ensure issues receive the rigor required to develop effective interim and long-term corrective actions that are timely, fully address all aspects of the issues and ensure the depth and breadth of extent of condition assessments is sufficient to prevent similar events from occurring in the future.

### (3) Findings

#### .1 Failure To Correct An Identified Issue Related To EECW Valves Throttled Below Analyzed Condition

Introduction: An NRC identified Green NCV of 10CFR50, Appendix B, Criterion XVI, Corrective Action, was identified for the licensee's failure to adequately evaluate and take prompt corrective actions to address an identified condition adverse to quality related to two EECW system flow control valves determined to have been throttled below the analyzed 0.125 inch gap for a period of approximately five months. This condition could have resulted in inoperability of the downstream safety-related Core Spray pump room heat exchangers due to flow blockage.

Description: During the 2009 NRC Component Design Basis Inspection (CDBI), the inspectors identified a Green NCV of 10CFR50, Appendix B, Criterion V, for an inadequate procedure used for flow balancing of the EECW system. That violation stated that the installed strainers for the EECW system were capable of filtering debris greater than 0.125 inches which allowed debris less than 0.125 inches to pass through the strainers. The CDBI inspectors determined that the inlet throttle valves to the 2A and 2B Core Spray (CS) room coolers, 2-THV-067-0551 and 2-THV-067-0594, were throttled as a result of the inadequate flow balancing procedure such that they had disc to seat clearances of less than 0.125 inches. The licensee responded to the NCV by correcting the inadequate flow balancing procedure, but did not correct the condition of the throttled valves until another flow balance was performed in April 2010. With the clearance less than that of the inlet screen, flow blockage in these valves due to debris passing through the EECW strainers could have occurred resulting in inoperability of these safety related room coolers.

In November 2009, the licensee generated PER 208374 in response to the condition of the throttled valves. The licensee performed an operability review of the throttled valves and concluded that there were no current operability issues with leaving the valves throttled to a disc to seat clearance of less than 0.125 inches. The licensee's basis in PER 208374 was that there was no history with clogging of the throttled valves;

however, during previous testing in March 2009 on the 2B CS room cooler, flow was found to be below acceptance criteria due to debris buildup on the valve disc causing low flow through the cooler. Therefore, the basis for the licensee concluding that the 2A and 2B CS room coolers were operable was not justified based on past operating experience. Thus, the licensee had no adequate analysis to support leaving the valves in a throttled condition between November 2009 and April 2010.

Analysis: The inspectors determined that failure of the licensee to promptly evaluate and correct a condition adverse to quality for two valves in the safety related EECW system throttled below their analyzed seat to disc clearance for approximately three months, and thus challenging operability of two CS pump room coolers from clogging of these valves with debris, was a performance deficiency (PD). The PD was determined to be more than minor because it affected the Equipment Performance attribute of the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of the Core Spray system to respond to initiating events to prevent undesirable consequences (i.e., core damage) since it resulted in 2 valves in the core spray system remaining throttled below their analyzed seat to disc clearance for several months after the licensee became aware of this condition, thus subjecting these valves to an increased likelihood of clogging with debris and affecting the reliability of the system.

The inspectors used Inspection Manual Chapter 0609, "Significance Determination Process", Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings" and determined that the finding was of very low safety significance (Green) because the finding is not a design deficiency, did not result in an actual loss of system or single train function, and was not potentially risk significant due to external events. The inspectors determined that this finding directly involved the cross-cutting area of Problem Identification and Resolution, component of the Corrective Action Program and aspect of Thorough Evaluation of Identified Problems because the licensee did not perform a thorough evaluation of identified problems such that the resolutions addressed the underlying causes and extent of condition. [P.1(c)]

Enforcement: 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Actions, states in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, defective material and equipment, and non-conformances, shall be promptly identified and corrected. Contrary to the above, the licensee failed to correct a condition adverse to quality in that two valves in the safety related EECW system were throttled below their analyzed seat to disc clearances for several months after the licensee became aware of this condition. This condition was identified in November 2009 and not corrected until April 2010. Because the licensee entered the issue into their CAP as PER 257029 and the finding is of very low safety significance (Green), this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC's Enforcement Policy: NCV 05000260/2010006-01: Failure To Correct The EECW Valves Throttled Below Analyzed Condition.

## .2 Failure to Implement the Provisions of Preventative Maintenance (PM) Program Which Contributed to a Manual Reactor Scram

Introduction: An NRC- identified Green finding was identified for the licensee's failure to implement the applicable provisions of the Tennessee Valley Authority (TVA) Preventative Maintenance (PM) Program and replace the coil in the solenoid valve used to open the Unit 3 Condensate Demineralizer bypass valve open solenoid coil on the

specified PM frequency. Failure of this coil was identified as a contributing cause in Licensee Root Cause Analysis for PER 200203 "Unit 3 Manual Scram Due to Lowering Reactor Water Level".

Description: On Aug. 24, 2009, Unit 3 was operating in Mode 1, at 100% power, with all nine condensate demineralizers in service. Operators inserted a manual scram due to lowering reactor water level when reactor feed pump 3B had tripped on low suction pressure due to multiple condensate booster pump trips. Unit 3 condensate booster pumps 3A and 3B had tripped on low suction pressure when five of the nine condensate demineralizer vessels service outlet valves isolated on a control system failure and the condensate demineralizer system bypass valve failed to open. Subsequent troubleshooting by the licensee revealed a failed coil in the open solenoid associated with the bypass valve. Failure of this coil caused the bypass valve to fail open which contributed to the required manual scram of the reactor as discussed in the licensee's root cause analysis of this event. The failed coil was not retained for a post-mortem evaluation as required by plant procedure MMDP-1 which precluded performance of additional failure analysis.

At the request of the team, the licensee performed a review of PM work orders from as far back as 1998 associated with any requirement to periodically replace the failed coil. This review revealed that PM Work Orders required that these coils be replaced every 96 months and that the Unit 3 coil had last been replaced in 1998. The coil was therefore significantly overdue for replacement prior to its failure. It should also be noted that this review revealed that there was no record of the Unit 1 coil being replaced. The licensee documented the results of this review in PER 245390.

Analysis: The licensee's failure to implement the provisions of the TVA Preventative Maintenance program was a PD which directly contributed to a manual reactor scram. The licensee's Preventative Maintenance Procedure NPG-SPP-06.2 required that Preventative Maintenance Work Orders "shall be completed, rescheduled or deferred, with appropriate approvals, by the responsible organization before becoming late". "The Preventative Maintenance Work Orders to replace the Condensate Demineralizer Bypass Valve open solenoid coil was not completed on schedule, was approximately 3 years overdue, and no technical evaluation was performed nor appropriate approvals by the responsible organization granted to justify non-completion of this Work Order. This PD was determined to be greater than minor because it was associated with the Initiating Events cornerstone attribute of Equipment Performance, and adversely affected the cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during at power operations since the failure to implement the provisions of the PM program increased the likelihood of a component failure and contributed to a plant transient. The inspectors used Inspection Manual Chapter 0609, "Significance Determination Process", Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings" and determined that the finding was of very low safety significance (Green) because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigating equipment or functions were not available. The inspectors determined that this finding directly involved the cross-cutting area of Human Performance, component of Work Practices and aspect of Procedural Compliance because licensee personal failed to follow the guidance contained in the Preventive Maintenance program. [H.4.b]

Enforcement: Enforcement action does not apply because the performance deficiency did not involve a violation of regulatory requirements. This finding was entered in the licensee's CAP as PER 245390 and is identified as FIN 05000296/2010-006-02, Failure to Implement the Provisions of Preventative Maintenance Program Which Contributed to a Manual Reactor Scram.

3. Failure to Correct a Condition Adverse to Quality Associated with the 2D Residual Heat Removal (RHR) Room Cooler

Introduction: An NRC- identified Green NCV of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, was identified for the licensee's failure to correct a condition adverse to quality by failing to implement adequate corrective actions to address degradation in the performance of the 2D RHR room cooler. On July 17, 2009, the 2D RHR room cooler thermal overload failed due to high mechanical vibrations, which the licensee failed to identify and correct prior to a subsequent failure on August 19, 2009.

Description: In May 2007 RHR and Core Spray (CS) room coolers were assigned maintenance rule a(1) status due to repetitive failures (three failures in the previous 24 months). The failures were attributed to high vibrations as a result of aging and poor maintenance practices. Corrective actions included adding motor mount stiffeners, larger mounting screws, and balancing weights. In August, 2007, the 2D RHR room cooler failed and the 2 A/C Core Spray room cooler was declared inoperable due to excessive vibration and noise. The causes of these failures were attributed to aging (metal fatigue) and high mechanical vibration due to poor alignment. After the August 2007 failures, the a(1) corrective action plan included a long term action to modify the configuration of the Core Spray and RHR room coolers to make them less susceptible to vibration induced failure.

On July 17, 2009, the 2D RHR room cooler motor tripped due to thermal overload. After the trip, the motor overload trip was reset and the motor was run. A PER was generated; however, the only corrective action assigned was to create a work order to check the condition of the thermal overloads. This work order was never performed and no other actions were taken to assess the condition of the room cooler despite a known history of mechanical induced vibration related failures. The cooler's blower fan subsequently failed due to mechanical vibration on August 19, 2009.

Analysis: The failure to implement adequate corrective actions after the 2D RHR motor trip on July 17, 2009 was a PD. The PD is more than minor because it is associated with the Equipment Performance attribute of the Mitigating Systems Cornerstone in that it adversely affected the reliability of the 2D RHR room cooler to respond to initiating events. The inspectors used Inspection Manual Chapter 0609, "Significance Determination Process", Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings" and determined that the finding was of very low safety significance (Green) because it did not result in inoperability of a safety function for greater than the allowed technical specification outage time since the cooler was repaired in less than the allowed seven days. The inspectors determined that this finding directly involved the cross-cutting area of Problem Identification and Resolution, component of the Corrective Action Program and aspect of Appropriate and Timely Corrective Actions because the licensee did not implement appropriate and timely corrective actions to resolve a condition adverse to quality. Specifically, the problem with the 2D RHR room cooler was not adequately addressed after the motor trip on July 17, 2009. [P.1 (d)]

Enforcement: 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, requires, in part, that measures be established to assure that conditions adverse to quality, such as deficiencies, are promptly corrected. Contrary to the above, from July 17, 2009 until August 19, 2009, a condition adverse to quality, degradation of the 2D RHR room cooler, was not promptly corrected resulting in the subsequent failure of the 2D RHR room cooler. Because the finding was determined to be of very low safety significance and has been entered into the licensee's CAP as PER 261728, this violation is being treated as an NCV consistent with Section 2.3.2 of the NRC's Enforcement Policy: NCV 05000260/2010006-03, Failure to Correct a Condition Adverse to Quality Associated with the 2D Residual Heat Removal (RHR) Room Cooler.

4 Failure to Correct a Condition Adverse to Quality Associated Cooling Water Flow Degradation in the 1B Core Spray Room Cooler.

Introduction: An NRC- identified Green NCV of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for the licensee's failure to correct a condition adverse to quality and implement adequate corrective actions for the degraded 1B Core Spray (CS) room cooler. The licensee failed to implement adequate correct actions to address the inability of the room cooler perform its design function with degraded cooling water flow prior to its loss of function on June 25, 2010. The licensee has since replaced the cooler in order to provide additional flow margin.

Description: From July 2007 to August 2010, the 1B CS room cooler failed eleven separate surveillance tests due to degraded cooling water flow. These failures were attributed to recurring raw water debris build up in the heat exchanger and its inlet throttle valve. Corrective actions to address the degraded flow included cycling the heat exchanger inlet throttle valve to clear it of debris and performing chemical cleaning of the heat exchanger if cycling the throttle valve proved unsuccessful. For the first ten failed surveillances, the licensee performed calculations to demonstrate that the cooler had been able to perform its design function based on actual heat exchanger flow and river temperature at the time of the surveillance, versus the maximum design bases river temperature of 95 degrees F.

As a long term corrective action, the licensee planned to replace the cooler with a different cooler that had better flow characteristics. However, delays occurred with the replacement of the cooler and the licensee failed to consider that summer river water temperatures would significantly reduce the cooler's heat removal margin. Therefore, no interim corrective actions were put in place and on June 25, 2010 the eleventh surveillance failure of the 1B CS room cooler occurred with the river temperature at approximately 90 degrees F. Since the river temperature was higher than during previous failures, the degraded heat exchanger flow was insufficient to maintain the cooler operable and the cooler was declared inoperable.

Analysis: The failure to take adequate corrective actions to address the potential high river temperature along with degraded heat exchanger flow was a PD. The PD was more than minor because it is associated with the Equipment Performance attribute of the Mitigating Systems Cornerstone in that it adversely affected the availability of the 1B CS room cooler to respond to initiating events. The inspectors used Inspection Manual Chapter 0609, Attachment 4, and determined that a Phase 2 screening was required because the 1B division of core spray was inoperable for greater than the technical

specification allowed out of service time. The 1B CS room cooler was found inoperable on June 25, 2010 and the previous successful surveillance had been performed on June 9, 2010. Using the "T/2" guidance to determine the exposure period, the 1B CS room cooler was assumed to be inoperable for 8 days, which exceeded the 7 day technical specification allowed outage time. The pre-solved Phase Two significance determination worksheet indicated that the issue was of very low safety significance (Green). The inspectors determined that this finding directly involved the cross-cutting area of Problem Identification and Resolution, component of the Corrective Action Program and aspect of Appropriate and Timely Corrective Actions because the licensee did not implement appropriate and timely corrective actions to resolve a condition adverse to quality. Specifically, debris fouling of the 1B CS room cooler was not corrected prior to its failure on June 25, 2010. [P.1(d)]

Enforcement: 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, requires, in part, that measures be established to assure that conditions adverse to quality, such as deficiencies, are promptly corrected. Contrary to the above, the repeated cooling water flow degradation in the 1B CS room cooler which represented a condition adverse to quality was not promptly corrected, resulting in the subsequent failure of the 1B CS room cooler on June 25, 2010. Because the finding was determined to be of very low safety significance and has been entered into the licensee's CAP as PER 254463, this violation is being treated as an NCV consistent with Section 2.3.2 of the NRC's Enforcement Policy: NCV 05000259/2010006-04, Failure to Correct a Condition Adverse to Quality Associated Cooling Water Flow Degradation in the 1B Core Spray Room Cooler.

.5 Failure to maintain Adequate Surveillance Procedure to Prevent Unplanned HPCI Isolation

Introduction: As self-revealing Green NCV of Technical Specifications 5.4.1.a, "Procedures," was identified for an inadequate surveillance procedure used to test High Pressure Coolant Injection (HPCI) pressure switches that resulted in an unplanned HPCI system isolation and HPCI system being declared inoperable.

Description: On July 12, 2010, Instrumentation and Maintenance (I&M) technicians were performing 2-SR-3.3.6.1.2 (3B), HPCI System Steam Supply Low Pressure Function Surveillance Procedure, when a HPCI isolation signal was generated. The technician informed Operations of the condition, the test procedure was exited, and HPCI was declared inoperable due to the unexpected system isolation. Operations entered Technical Specifications 3.5.1(c) for HPCI system being inoperable. Operations realigned HPCI system per Abnormal Operating Procedure 2-AOI-64-2B, Group 4 High Pressure Coolant Isolation, and restored HPCI to operable status. During troubleshooting, I&M technicians identified the volt ohm meters (VOM) had been left in place. A step in the procedure stated to place VOMs on specific terminals to test for stray voltage. The technician performing the test interpreted this step to mean attach the VOMs and not remove them as he proceeded through the procedure. With multiples VOMs installed simultaneously and set to the ranges specified, sufficient current was passed through the circuit to allow the relays to actuate causing the isolation. The inspectors identified the I&M technicians had incorrectly indicated that the HPCI system was not safety related or equipment required by Technical Specifications and as a result, did not discuss potential adverse consequences during the pre-job brief within their group or with Operations. The licensee had previously updated the Unit 3 procedure to replace the word "place" with the phrase "connect and disconnect". The Unit 1 and Unit

2 procedures had not been updated per the procedure upgrade program at the time of this event. The licensee entered this event in the corrective action program as PER 239313 and subsequently updated Unit 1 and Unit 2 procedures to clearly state to “connect and disconnect” the VOMs at each terminal during surveillance testing. The licensee reported this event to the NRC in LER 05000260/2010-005-00.

Analysis: The failure to establish an adequate procedure used for connecting and disconnecting VOMs during testing of pressure switches on the HPCI system was a performance deficiency. The performance deficiency was more than minor because it affected the equipment performance attribute of the Mitigating Systems cornerstone in that the licensee did not ensure reliability and availability of the HPCI system to respond to initiating events to prevent undesirable consequences. The inspectors evaluated the finding using NRC Inspection Manual 0609, Attachment 0609.04, SDP Phase 1 Screening and Characterization of Findings. The finding was determined to be of very low safety significance because HPCI was out of service for a total of about 12 hours and did not exceed its TS allowed outage time per TS 3.5.1.c. The inspectors determined that this finding directly involved the cross-cutting area of Human Performance, component of Resources and aspect of Complete Documentation because the licensee failed to provide an adequate procedure to perform the HPCI surveillance test. [H.2(c)]

Enforcement: Technical Specification 5.4.1.a, Procedures, stated written procedures shall be established, implemented, and maintained covering activities recommended in Regulatory Guide 1.33. Regulatory Guide 1.33, Appendix A, Section 9, Procedures for Performing Maintenance, stated that maintenance that can affect the performance of safety-related equipment should be properly preplanned and performed in accordance with written procedures appropriate to the circumstances. Contrary to the above, on July 12, 2010, the licensee failed to establish a procedure that ensured test equipment was not left in-place during performance of a HPCI system surveillance test which led to an unplanned HPCI system isolation. Because the finding is of very low safety significance and has been entered into the licensee’s corrective action program as PER 239313, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC’s Enforcement Policy: NCV, 05000260/2010006-05, Failure to Maintain an Adequate Surveillance Procedure to Prevent Unplanned HPCI Isolation.

.6 Inadequate Maintenance Procedure for Siemens Horizontal Vacuum Circuit Breakers

Introduction: An NRC-identified Green NCV of Technical Specification (TS) 5.4.1 was identified for the licensee’s failure to have adequate preventative maintenance procedures for Siemens Horizontal Vacuum Circuit Breakers. The plant procedure for these circuit breakers did not provide guidance for checking the tightness of the closing spring charging motor mounting bolts. As a result, on June 15, 2010, while the 3C residual heat removal (RHR) pump was in service for suppression pool cooling, the charging motor in the pump breaker cubicle became detached from its mount. The charging spring failed to recharge and the pump would not have restarted if needed following a trip of the circuit breaker. The licensee reinstalled the charging motor and restored the 3C RHR pump to service. The licensee also revised the maintenance procedure to include instructions for ensuring the charging motor was securely fastened to the circuit breaker.

Description: On June 15, 2010, with the 3C RHR pump in service for suppression pool cooling, plant operators identified that the bolts which hold the circuit breaker closing spring charging motor to the cubicle had come out of their bolt holes and the motor had become detached. Consequently, the closing spring failed to charge and the breaker would not reclose if the circuit breaker had opened and subsequently been called upon such as during a loss of off-site power event.

The licensee's maintenance procedure for the 3C RHR pump circuit breaker, EPI-0-000-BKR015, 4KV Wyle/Siemens Horizontal Vacuum Circuit Breaker (Type-3AF) and Compartment Maintenance, Revision 28, did not contain instructions for checking the tightness of the bolts or visually verifying that the lock washers were sufficiently flattened. The technical manual supplied by the manufacturer for Siemens horizontal vacuum circuit breakers, designated as plant document BFN-VTD-SI06-0040, Siemens 5kV Horizontal Vacuum Circuit Breaker, specified that all screw connections and locking devices should be checked for tightness during routine maintenance activities. It also specified that a general visual inspection of the circuit breaker should be performed. However, these instructions were not included in plant procedure EPI-0-000-BKR015, Revision 28. As a result, these checks were not performed during the previous preventative maintenance performed in 2006. This procedural deficiency has existed since the breakers were installed starting around the year 2000.

Analysis: The failure to have an adequate maintenance procedure which incorporated vendor guidance for circuit breaker maintenance was a PD. This PD was more than minor because it affects the Mitigating Systems Cornerstone objective of ensuring the availability, reliability, and operability of the 3C RHR pump to perform its intended safety functions during a design basis event and the cornerstone attribute of Procedure Quality. The finding was screened using Manual Chapter 0609.04, "Phase 1 – Initial Screening and Characterization of Findings," and was determined to be of very low safety significance (Green) because it did not result in inoperability of a safety function for greater than the allowed technical specification outage time and was not potentially risk-significant due to external events. The inspectors determined that this finding directly involved the cross-cutting area of Human Performance, component of Resources and aspect of Complete Documentation because the licensee did not maintain adequate plant procedures for equipment maintenance. Specifically, procedure EPI-0-000-BKR015, Revision 28 did not contain guidance for checking the charging motor bolt tightness resulting in the 3C RHR pump charging motor becoming detached and adversely affecting train operability. [H.2(c)]

Enforcement: Technical Specification 5.4.1, Procedures, requires in part that procedures shall be established, implemented, and maintained covering the activities in Regulatory Guide (RG) 1.33, Revision 2, Quality Assurance Program Requirements. RG 1.33, Appendix A, Section 9, Maintenance, states, in part, that maintenance that can affect the performance of safety-related equipment be performed in accordance with documented instructions. Contrary to the above, on June 15, 2010, the licensee did not have an adequate maintenance procedure for the Siemens horizontal vacuum circuit breakers because the closing spring charging motor mounting bolts were not tightened to ensure the breaker remained operable. As a result, on June 15, 2010, the 3C RHR pump circuit breaker failed to recharge after closing. Because this finding is of very low safety significance (Green) and is entered into the licensee's corrective action program as PER 234443, this finding is being treated as an NCV, consistent with Section 2.3.2 of

the NRC's Enforcement Policy: NCV 05000296/2010006-06, Inadequate Maintenance Procedure for Siemens Horizontal Vacuum Circuit Breakers Circuit Breakers.

b. Assessment of the Use of Operating Experience (OE)

(1) Inspection Scope

The inspection team interviewed station personnel, attended selected daily CARB and PSC meetings and evaluated CAP documents to determine if OE was being used effectively. In addition, the inspectors reviewed the licensee's evaluation of selected TVA and industry operating experience information including SR's and PER's from Watts Bar and Sequoyah, industry OE, NRC Regulatory Information Summaries (RIS) and Information Notices, and generic vendor information to verify issues applicable to Browns Ferry were appropriately addressed or incorporated into evaluations conducted on station issues. Procedure SPP-3.9, Operating Experience Program, was reviewed to verify that the requirements delineated in the program were being implemented by station personnel. Program guidance documents for the evaluation of issues within the CAP were reviewed to verify that guidance was being following for incorporating internal and external OE into SR, PER and WO evaluations. Documents reviewed are listed in the Attachment.

(2) Assessment

The inspectors determined that OE was generally used proactively and to address events or near-misses that have occurred at Browns Ferry. OE was regularly included in System Monitoring Reports and SR's / PER's associated with station events as part of the causal investigations and corrective action development process.

Industry OE was processed at either the corporate or plant level depending on the source and document type. Relevant information was then forwarded to the applicable department for further action or informational purposes. Any documents requiring action were entered into the CAP for tracking and closure.

Work groups, such as maintenance, actively incorporate operating experience, both from external sources as well as feedback following performance of a specific activity, resulting in briefing packages that allow for the dissemination of lessons learned to other employees performing work at the site.

The inspection team did identify an isolated example of where OE from another TVA site pertaining to a breaker failure had been discounted due to the breaker being a model not used at Browns Ferry. However, the failure mechanism was applicable to the breakers used at Browns Ferry and a more detailed review of this information may have been useful in preventing a breaker failure for the same reason at Browns Ferry. The details of this issue are contained in the Findings section above as NCV 05000296/2010006-06, Inadequate Maintenance Procedure for Siemens Horizontal Vacuum Circuit Breakers Circuit Breakers.

(3) Findings

No findings were identified

c. Assessment of Self-Assessments and Audits

(1) Inspection Scope

The inspectors reviewed completed self assessments and audits conducted by station and corporate organizations to assess the thoroughness of these reviews and to verify that corrective actions resulting from these activities were appropriately prioritized and entered into the CAP as required. The inspectors verified that the self assessments and audits were consistent with the NRC's assessment of the CAP and supporting programs. In addition, the inspectors reviewed System Monitoring Reports for selected systems to determine if ongoing issues were receiving the visibility needed to ensure department and station management personnel were aware of issues that required resources or attention to address. The inspectors reviewed the station's trending program and trend reports covering the period of time since the last PI&R inspection.

(2) Assessment

The inspectors determined that the scopes of self assessments and audits conducted over the past 12 months were adequate and self-critical in nature. Corrective actions were incorporated into the CAP and tracked to completion. Updates on the status of these action items were provided to station management at CARB meetings and via routine metric summary reports. The inspectors determined that the licensee had adequately prioritized issues identified by these self assessments and audits in the CAP.

Based on the review of System Monitoring Reports, the inspectors determined that, in general, issues were captured in the reports and they had the appropriate distribution. However, some examples were noted where the potential safety impact had not been fully discussed to ensure additional resources were made available for expedited resolution where required. For example, the Residual Heat Removal (RHR) System Monitoring Reports, issued in 2009 and 2010, discuss the high vibration issues on RHR and Core Spray cooler drive trains; however, the reports continued to note that initial corrective action plans were to have been completed by December 2008. In addition, there was no discussion of the potential safety impact these failures could have on the systems or what the continued vulnerability was, based on not completing the corrective actions. There had also not been any discussion about the impact of ECCW cooler fouling or actions needed to address the continuing condition in the reports.

The station currently produces regular reports containing trends on various aspects of the CAP. However, due to limitations of the software, the value of the reports has been less than fully effective. Internal and external assessments of the CAP have identified this shortcoming and the licensee was working to develop alternate capabilities that will allow meaningful metrics to be developed and trended for department and station management to evaluate the progress of the CAP Improvement initiative. The inspection team noted that many of the metrics presented in the monthly and quarterly reports were shown in different formats each month which made it difficult to compare performance from one report to the next and as a result, focus on those areas that were not trending in a positive direction. Trend PER's have been initiated based on informal "knowledge trending" where members of CARB or the PSC recognize similarities of issues to past events. The development of an effective trending program that allows management to identify adverse trends and implement proactive corrective actions is an

area that the station has recognized as being under development; however, additional resources have been allocated to this area and progress was demonstrated during the inspection period.

(3) Findings

No findings were identified

d. Assessment of Safety-Conscious Work Environment

(1) Inspection Scope

The inspectors interviewed members of the plant staff to develop a general perspective of the safety-conscious work environment at the station and determine if any conditions existed that would cause employees to be reluctant to raise safety concerns. The inspectors reviewed the licensee's Concerns Resolution Program (CRP) which provides an alternate method to the CAP for employees to raise concerns and remain anonymous. The inspectors interviewed both the station CRP coordinator and the corporate CRP manager and reviewed CRP documents and reports to verify that concerns were being identified, properly reviewed, processed in a timely manner, and appropriately resolved. The inspection team also reviewed the 2009 Employee Culture Survey and discussed the documented results with the station and corporate CRP managers.

(2) Assessment

Based on interviews held with plant staff and CRP managers, reviews of PER's and selected CRP packages, CRP metrics and an assessment of the implementation of the licensee's CRP, the inspectors concluded that personnel were willing to identify and report problems or concerns using the multiple processes available to them. In addition, station management demonstrated an attitude of objectively assessing issues that were raised by station personnel, even when done anonymously, and took prompt action to address issues when possible. The inspectors noted one positive factor in that feedback was provided to employees when contact information was available, which let employees know how their issues had been dispositioned. Several individuals stated that regardless of the eventual outcome, receiving feedback allowed them to see that their issue had been reviewed and that future concerns, if they existed, could be raised and would be reviewed by the management team.

(3) Findings

No findings were identified

4OA3 Event Follow-up

.1 (Closed) LER 05000260/2010-004, HPCI Isolation During Performance of HPCI Time Delay Relay Calibration:

On June 16, 2010, with Unit 2 HPCI system inoperable for testing, Electrical Maintenance was performing 2-SR-3.3.6.1.6(3), HPCI Time Delay Relay Calibration,

when an unplanned HPCI isolation signal was generated because two relay contacts unexpectedly made contact. TVA determined the relay contact boots used for the surveillance test failed to prevent a pair of relay contacts from making contact during testing, resulting in the HPCI isolation. The Unit 2 HPCI system responded as designed when HPCI isolation logic was satisfied. The HPCI auto isolation logic was reset and the test was re-performed using new boots. The test results were satisfactory and HPCI was restored to operable status. The LER was reviewed by the inspectors and no findings or violations of NRC requirements were identified. The licensee documented the HPCI isolation event in PER 235338.

.2 (Closed) LER 05000260/2010-005; HPCI Isolation During Performance of HPCI Steam Supply Low Pressure Functional Test:

On July 12, 2010, Instrumentation and Maintenance personnel were performing surveillance procedure, 2-SR-3.3.6.1.2(3B), High Pressure Coolant Injection (HPCI) Steam Line Supply Low Pressure Functional Test, on Unit 2 HPCI system when an unexpected isolation signal was generated. Operations declared the HPCI system inoperable and entered Technical Specification Limiting Condition for Operation 3.5.1, action c. TVA determined the cause for the HPCI isolation signal was the installation of multiple volt ohm meters (VOMs) on the associated pressure switch circuits during performance of the surveillance test. The VOMs were placed on terminals specified by the surveillance procedure to determine the presence of voltage on the pressure switch circuits to be tested. The steps in the procedure did not clearly indicate the requirement to remove the VOM once the required checks were completed prior to proceeding to the next terminal. The technician placed multiple VOMs on the terminals and created a path for current to flow and caused the isolation signal to be generated. At time HPCI system was isolated, Instrumentation and Maintenance stopped the surveillance test, Operations entered Abnormal Operating Instruction, 2-AOI-64-2B, Group 4 High Pressure Coolant Isolation, and operators returned the Unit 2 HPCI system to standby alignment. The test was re-performed by connecting and disconnecting one VOM at a time and the surveillance test was completed satisfactory. The operators declared HPCI operable upon completion of the test. Corrective actions included revising the procedure to clearly state that the VOMs were to be disconnected prior to proceeding to the next terminal. Enforcement aspects of this issue are discussed in Section 40A2.a.3.5.

.3 (Closed) LER 05000296/2009-002, Revision 1, Unit 3 Reactor Core Isolation Cooling (RCIC) System becomes Inoperable:

On November 14, 2009, Unit 3 operators received indication that the RCIC flow controller failed and immediately declared the system inoperable. The power connector to the RCIC flow controller was found loose. It was reseated on its power supply and proper controller output voltage was verified. Subsequently, RCIC was declared operable. No maintenance activity was ongoing at time of the event in the vital area where the power supply was located. The licensee verified that no RCIC controller instrument critical components failed and that the problem was isolated to the loose connection. The licensee reviewed work history on the RCIC system and preventive maintenance was last performed on the power supply rack in October of 2009 with the post maintenance test completed satisfactorily. TVA performed an extent of condition and did not find any other partially connected/seated ribbon connectors on all three units. The LER was reviewed by the inspectors and no findings of significance or

violations of NRC requirements were identified. The licensee documented the RCIC flow controller failure in PERs 208077, 234082, and 207915.

4OA6 Exit Meeting

On September 24, 2010, the inspectors presented the inspections results to Mr. Rod Krich, Vice President, Nuclear Licensing, Mr. Keith Polson, Site Vice President and other members of their staffs who acknowledged the findings. The inspectors confirmed that no proprietary information was provided during the inspection.

## SUPPLEMENTARY INFORMATION

### KEY POINTS OF CONTACT

#### Licensee Personnel

W. Baker; Operations CAP Coordinator  
J. Barker; Operations  
E. Bates; Browns Ferry Licensing  
S. Bonn; Maintenance Manager  
P. Campbell; Engineering  
P. Chase; Quality Assurance Manager  
J. Colvin; Supervisor – Program Engineering  
G. Doyle; Acting Director; Safety and Licensing  
J. Davenport; Browns Ferry Licensing  
M. Durr; Design Engineering Manager  
M. Ellett; Maintenance Rule Program Engineer  
J. Emens; Site Licensing Supervisor  
B. Evans; I&C Maintenance  
J. Fitzer; Wylie Laboratories Senior Engineering Specialist  
P. Gilbert; In Service Testing Program Engineer  
K. Gregory; Director Nuclear Projects  
K. Hill; Engineering  
I. Hillis; Operating Experience Site Representative  
S. Kelly; Outage  
R. Krich; Vice President; Nuclear Licensing  
J. Lewis; Browns Ferry Operations  
D. Matherly; 95002 Project Manager  
M. McAndrew; Operations Superintendent  
G. McClain; Condensate System Engineer  
M. McKelly; Backup Residual Heat Removal System Engineer  
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S. Walton; Mechanical Maintenance  
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#### NRC Personnel

G. Guthrie, Chief, Reactor Projects Branch 6  
T. Ross; Senior Resident Inspector, Browns Ferry Nuclear Plant

## LIST OF REPORT ITEMS

### Opened and Closed

05000260/2010006-01	NCV	Failure To Correct The EECW Valves Throttled Below Analyzed Condition (Section 40A2.a.3.1)
05000296/2010006-02	FINDING	Failure to Implement the Provisions of Preventative Maintenance (PM) Program Which Contributed to a Manual Reactor Scram (Section 40A2.a.3.2)
05000260/2010006-03	NCV	Failure to Correct a Condition Adverse to Quality Associated with the 2D Residual Heat Removal (RHR) Room Cooler (Section 40A2.a.3.3)
05000259/2010006-04	NCV	Failure to Correct a Condition Adverse to Quality Associated Cooling Water Flow Degradation in the 1B Core Spray Room Cooler (Section 40A2.a.3.4)
05000260/2010006-05	NCV	Failure to maintain an Adequate Surveillance Procedure to Prevent an Unplanned HPCI Isolation (Section 40A2.a.3.5)
05000296/2010006-06	NCV	Inadequate Maintenance Procedure for Siemens Horizontal Vacuum Circuit Breakers Circuit Breakers (Section 40A2.a.3.6)

### Closed

05000260/2010-004	LER	HPCI Isolation During Performance of HPCI Time Delay Relay Calibration (Section 40A3.1)
05000260/2010-005	LER	HPCI Isolation During Performance of HPCI Steam Supply Low Pressure Functional Test (Section 40A3.2)
05000296/2009-002, Rev. 1	LER	Unit 3 Reactor Core Isolation Cooling System becomes Inoperable (Section 40A3.3)

## LIST OF DOCUMENTS REVIEWED

### Procedures

OPS-NGGC-1305, Operability Determinations Rev. 2  
NPG-SPP-06.2, Preventative Maintenance Rev. 0001  
SPP-3.9, Operating Experience Program Rev. 0004  
NPG-SPP-03.1.3, Regulatory Screening Rev. 0000  
OPDP-8, Limiting Conditions for Operation Tracking Rev. 0003  
2-SR-3.3.6.1.6(3) Rev.5 HPCI Time Delay Relay Calibration, Attachment 3 (page 2/2)  
2-SR-3.3.6.1.2(3B) Rev. 5 HPCI Steam Supply Low Pressure Functional Test  
2-SR-3.3.6.1.2(3B) Rev. 6 HPCI Steam Supply Low Pressure Functional Test  
MCI-0-000-GTV002 Rev. 3 Double Disc, Pressure Seal Gate Valves  
1-SR-3.6.1.1.1(OPT-A) Rev. 4 Unit 1 Primary Containment Total Leak Rate  
EPI-0-000-BKR015, 4KV Wyle/Siemens Horizontal Vacuum Circuit Breaker (Type-3AF) and  
Compartment Maintenance, Revision 28  
BFN-VTD-S106-0040, Siemens 5kV Horizontal Vacuum Circuit Breaker  
BP-108, Check-In, Check-Out Process  
BP-132; Work Environment Oversight Group, Rev. 0

### SR's / PER's

PER 203538 BFN Unit 2 Manually Tripped  
PER 171722 Risk Execution  
PER 208374 EECW Throttled Valves to 2A and 2B CS Room Coolers  
PER 167344 Failed AC Step  
PER 200203 EOI-1 entry/exit on unit 3 SCRAM  
PER 226627 MSR/V As-Found Set Points  
PER 208636 EECW Strainer Perforations  
PER 178588 BFN Review of GE Part 21  
PER179415 Damaged Air Lock Doors  
PER 200874 Transformer, Switchyard and Grid Reliability  
PER 201552 Flow Accelerated Corrosion  
PER 204361 NRC IN-2009-14  
PER 204772 NRC IN-2009-20  
PER 215895 HPSI Governor Valve Failure  
PER 216877 NRC IN-2010-03  
PER 226507 Unit 2 HPCI pump elevated casing temperature oil sample  
PER 235338 Unit 2 HPCI Isolation during 2-SR-3.3.6.1.6(3)  
PER 208627 Unit 2 HPCI Isolation during 2-SR-3.3.6.1.3(3DFT)  
PER 232668 Issue Revision to LER 296/2010 003  
PER 234082 Inadequate corrective action in PER 208077  
PER 207915 Unit 3 HPCI Inoperable  
PER 238036 Part 21 HPCI Turbine Overspeed Reset Control Valve Diaphragm  
PER 177206 HPCI Inoperable due to Control Oil Leak on 1-PCV-073-0018C  
PER 200863 Unit 1 ECCS Div II Inverter Failure  
PER 239313 Unit 2 HPCI Inadvertently isolated

PER 208077 Unit 3 RCIC Unplanned entry into an LCO  
 PER 228565 ACE Repeat Leakage Issues with HPCI Steam Admission Valves Units 1, 2, 3  
 PER 228565 Repeat issues with HPCI Turbine Steam Supply Valve Leakage  
 PER 176611, RHR Room Cooler Thermal Overloads Tripped  
 PER 176648, 480 Volt Reactor Motor Operated Valve Board 2D and Residual Heat Removal Subsystem Inoperable  
 PER 177269, Unit 3 RHR Room Cooler 3A  
 PER 177473, 2C RHR Room Cooler  
 PER 178142 DG Paralleling Design Basis  
 PER 178589, RHR Room Cooler 2B Past Operability  
 PER 179343, 2D RHR Room Cooler Failure  
 PER 203164, RHR Room Cooler Bearings and Blowers Breaking Loose from Shaft  
 PER 203537, RCIC Inoperable Longer than Allowed by Technical Specifications  
 PER 210437, Gas Release from RHR Loop II  
 PER 211845 RHR and Core Spray Room Cooler a(1) Concerns  
 PER 213326, Deficiency with Past Operability  
 PER 213692, Unplanned LCO Entry  
 PER 213360, Extending Hardware Corrective Actions Beyond Refueling Outage  
 PER 216996, 2-FCV-074-0073 Failed to Open  
 PER 217659, Green LIV - EDG Paralleling Operations  
 PER 218493, Unit 2 Entry Into TS 3.0.3  
 PER 220791, Fuel Handling Supervisor Relief Requirements  
 PER 220807, Valve Failed to Open During PMT  
 PER 222788, RHR 2A Room Cooler Fan  
 PER 222944, U3 Suppression Pool Spray Valve Failed to Open  
 PER 225844, Deficient IST Testing of RHRSW/EECW Pumps  
 PER 226010, Oil Leak from 2D RHR Pump Motor Bearing  
 PER 228331, Inappropriate Closure of PER 169867  
 PER 234168, 2-FCV-074-0066 Failed to Open  
 PER 234443, 3C RHR Pump Breaker Failure  
 PER 235017, Unplanned LCO Entry  
 PER 235900, U2 RHR DW Spray Line Void  
 PER 238010, RHR Cooler Low EECW Flow  
 PER 238314, 1A/1C and 2B/2D RHR Room Coolers Low Flow  
 PER 241743, U2 RHR DW Spray Line Void  
 PER 244676, EECW Flush of the 1A/1C RHR Room Cooler  
 PER 244937, Timed Gas Release During RHR Loop II Venting

#### Self-Assessments / Audits

TVA PI&R Assessment, February 15 – March 12, 2010  
 Browns Ferry Nuclear Plant PI&R Assessment, April 12 – 16, 2010  
 Browns Ferry Nuclear Plant PI&R Inspection Self Assessment; August 2 – 6, 2010

#### Work Orders / Work Requests

WO 09711620 HPCI Testable check valve 1-ckv-073-0045 binding  
 WO 110892836 Unit 2 HPCI oil sample for elevated HPCI pump casing temperature  
 WO 111342963 HPCI oil system low oil reading

- WO 09725109 HPCI vibration data collection points  
 WO 110903501 2-FCV-073-0016 MOVATS  
 WO 09725842 Replace cable connectors on 1-LPNL-925-229, 3-LPNL-925-229  
 WO 111148386 Replace Diaphragm on 1-PCV-073-0018C  
 WO 111148387 Replace Diaphragm on 2-PCV-073-0018C  
 WO 1111448388 Replace Diaphragm on 3-PCV-073-0018C  
 WO 111155876, Install ETT sensor and perform MOVATS (adjust the limits as required)  
 WO 111058562, HPCI 2-TE-73-54F reading downscale low on ICS  
 WO 111196492, Perform electrical soft back-seat on 2-FCV-073-0002  
 WO 09720232, Packing Leak  
 WO 09726201, Catch device 1243 has at some point been pressed against the hot drain line that leads from the 3-FCV-073-0006A Valve to the 3-TV-073-594 FCV-73-6A LEAKAGE TEST VLV. There is now a small melted spot on the catch device and some melted catch device resin burnt to the pipe. Need review group to discuss insulating the drain line versus changing the configuration of the catch device as to which solution is most practical.  
 WO 08723266, During Performance Of 1-SI-4.7.A.2.G-3/3A, 1-FCV-73-0045 Failed Acceptance Criteria Leak Rate.  
 WO 08724449, During performance of 1-SR-3.6.1.3.5(SD) section 7.8 step [2.5], the disc did not move as required per step [2.6], the disc position in the control room stayed "green only" contrary to step [2.7]A. The actuator position did turn "red only" as required in step [2.7]B. ICS point DIG025 indicated "closed" contrary to step [2.8]. When the pushbutton was released per step [2.9], none of the indications changed. Actuator is still showing OPEN and the disc is still showing CLOSED. Repair as required.

#### Other Documents

- LER 259/2009-004 Unit 1 HPCI Inoperable Due to Control System Oil Leak  
 LER 259/2009-006 Unit 1 Inoperable HPCI due to ECCS Inverter Failure  
 LER 260/2009-009 Unit 2 HPCI Isolation during Steam Line High Temperature Test  
 LER 260/2010-004 Unit 2 HPCI Isolation during Performance of Time Delay Relay Test  
 LER 260/2010-005 Unit 2 HPCI Isolation during HPCI Steam Supply Low Pressure Test  
 LER 296/2009-002 Unit 3 Inoperable HPCI due to Excessive Water in Steam Drain  
 LER 296/2009-002 Rev. 1 Unit 3 Inoperable HPCI due to Excessive Water in Steam Drain  
 LER 260/2009-007 Manual Scram Due to Loss of Feed pump Suction Pressure  
 LER 296/2009-001 Manual Reactor Scram Following Loss of Condensate Booster Pumps  
 LER 296/2010-001 Main Steam Relief Valve As-Found Set Point Exceeded TS Lift Pressure Value  
 LER 50-260/2009-005, 480 Volt Reactor Motor Operated Valve Board 2D and Residual Heat Removal Subsystem Inoperable Longer than Allowed by Technical Specifications  
 LER 50-2009-008, RCIC Inoperable Longer than Allowed by Technical Specifications  
 LER 50-260/2010-001, Both Loops of Residual Heat Removal Inoperable  
 NCV IR 2009-005-03 Inadequate Operating Procedures Cause Partial Loss of Reactor Feed Water Which Results in Unit 2 manual Reactor Scram  
 NCV IR 2009-008-02 Violation of 10 CFR 50, Appendix B, Criterion V for Inadequate Procedure for EECW System  
 NCV IR 2010-003-02 Unit 3 RCIC System Inoperable Beyond TS Allowed Outage Time  
 LIV IR 2010-003 Unit 3 TS3.4.3 Safety/Relief Valves  
 System 073 HPCI Monitoring Plan Units 1, 2, 3  
 System 073 HPCI System Health Report Unit 1  
 System 073 HPCI System Health Report Unit 2

System 073 HPCI System Health Report Unit 3  
BFN 50-7073 Design Criteria Document for HPCI Units 1, 2, 3  
HPCI FSAR 6.4, 6.5, 6.6  
BFN Unit 2 Technical Specification 3.5  
PID Flow Diagram HPCI System 67-M-1-47E812-1 R031  
PID Valve with air cylinder limit switches 3-15184-01  
Operations Work-Arounds and Burdens List for HPCI system on Units 1, 2, 3  
List of Open Work Orders on HPCI Units 1, 2, 3  
List of Open PERs on HPCI Units 1, 2, 3  
Part 21 SC 10-09 GE issued on HPCI control valve diaphragm  
Residual Heat Removal System Monitoring Report, September 2, 2010  
Flow Diagram, Residual Heat Removal System

## LIST OF ACRONYMS

ACE	Apparent Cause Evaluation
CAP	Corrective Action Program
CARB	Corrective Action Review Board
CDBI	Component Design Basis Inspection
CRP	Concerns Resolution Program
CS	Core Spray system
EECW	Emergency Equipment Cooling Water
FIN	Finding
HPCI	High Pressure Coolant Injection system
INPO	Institute of Nuclear Power Operations
LER	Licensee Event Report
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OE	Operating Experience
PER	Problem Evaluation Request
PI&R	Problem Identification and Resolution
PM	Preventive Maintenance
PSC	PER Screening Committee
RCA	Root Cause Analysis
RCIC	Reactor Core Isolation Cooling system
RHR	Residual Heat Removal system
SDP	Significance Determination Process
SR	Service Requests
TVA	Tennessee Valley Authority
VOM	Volt Ohm Meter
WO	Work Orders