

# Browns Ferry 1

## 4Q/2010 Plant Inspection Findings

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### Initiating Events

**Significance:**  Sep 30, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

#### **Failure to adequately test molded case circuit breakers**

The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," for failure to establish a preventive maintenance (PM) test program for safety-related molded case circuit breakers (MCCBs) to demonstrate these breakers would perform satisfactorily upon demand. Since initial startup of all three units, the inspectors found that the licensee had not included 612 critical MCCBs, many of them safety-related, in their PM program which resulted in the MCCBs receiving no planned maintenance or testing. The licensee entered this issue into the corrective action program as problem evaluation report (PER) 209095. The licensee's corrective actions included: identifying all critical MCCBs that required preventive maintenance, developing test procedures for these MCCBs, performing testing for all affected MCCBs, and conducting an extent-of-condition review of all safety-related components potentially excluded from the PM program.

This finding was determined to be of greater than minor significance because it was associated with the Protection Against External Factors attribute of the Initiating Events Cornerstone and adversely affected the cornerstone objective to limit the likelihood of those events, such as fire, that challenge critical safety functions during shutdown as well as power operations. Specifically, the lack of a PM program for safety-related MCCBs resulted in no periodic planned maintenance or testing being performed since original installation, which in most cases was over thirty years. Based on operating experience, this could result in a breaker being slow to trip or sticking in the "on" position after an over-current condition. In accordance with IMC 0609, Significance Determination Process (SDP), Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings," this finding was determined to require a Phase 3 analysis since the finding represented an increase in the likelihood of a fire caused by an electrical fault at the MCCB compartment with the breaker not opening. A regional Senior Reactor Analyst conducted a Phase 3 SDP analysis, which concluded that the finding was of very low safety significance (Green).

The cause of this finding was directly related to the cross cutting aspect of Appropriate Corrective Actions in the Corrective Action Program component of the Problem Identification and Resolution area, because the licensee did not adequately implement corrective actions to resolve the deficiencies previously identified by PER 131875 regarding certain Westinghouse MCCBs that were not in the PM program [P.1(d)]. (Section 40A5.4)

Inspection Report# : [2010004](#) (*pdf*)

**Significance:**  Jun 30, 2009

Identified By: NRC

Item Type: FIN Finding

#### **Untimely actions to resolve excessive IBC system condensation results in U1 reactor scram**

A Green self-revealing finding was identified for a failure to implement corrective actions in a timely manner to address excessive isophase bus cooling system condensation that resulted in a Unit 1 reactor scram caused by water accumulation in the isophase bus ductwork, which created an electrical ground fault on the main generator isophase busses. This event was entered into the licensee's corrective action program as PER 163815.

This finding was determined to be greater than minor because it was associated with the Initiating Event 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. The finding was evaluated using Phase 1 of the At-Power SDP, and was determined to be 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 cause of this finding was directly related to the cross-cutting aspect of appropriate

and timely corrective actions in the area of Problem Identification and Resolution because the license had identified an abnormal equipment condition related to excessive IBC system condensation for which immediate actions were specified but not carried out (P.1.d). (Section 40A3.2)

Inspection Report# : [2009003](#) (pdf)

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## Mitigating Systems

**Significance:** TBD Dec 31, 2010

Identified By: Self-Revealing

Item Type: AV Apparent Violation

**RHR subsystem inoperable beyond the TS allowed outage time**

Inspection Report# : [2010005](#) (pdf)

**Significance:**  Dec 31, 2010

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

**Degraded 1C RHR motor rendered one RHR subsystem inoperable beyond the TS allowed outage time**

•Green. A self-revealing non-cited violation (NCV) of Unit 1 Technical Specifications (TS) Limiting Condition for Operations (LCO) 3.6.2.3, Suppression Pool Cooling was identified for the licensee's failure to correct a degraded condition of the 1C Residual Heat Removal (RHR) pump motor that rendered it inoperable for greater than the TS allowed outage time of 30 days. Specifically, the 1C RHR pump motor suffered a catastrophic failure on October 27, 2010 and was subsequently determined to have been in a degraded condition since November 2007. This condition would have prevented the pump from performing its intended safety functions during the system's required mission time. The licensee entered this issue into the corrective action program as problem evaluation report (PER) 274840. The 1C RHR pump motor was subsequently repaired during the Unit 1 refueling outage and returned to service on November 10, 2010 prior to Unit 1 restart.

This performance deficiency was considered greater than minor because it was associated with the Mitigating Systems cornerstone and adversely affected the equipment performance objective to ensure the availability and capability of the RHR system to respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the 1C RHR subsystem was degraded to the point that it was incapable of performing its intended safety functions for the system's required mission time. Since the 1C RHR pump motor failure occurred during Mode 5 shutdown conditions after a significant period of shutdown cooling operation, the finding was evaluated according to Inspection Manual Chapter 609, Appendix G, Shutdown Operations Significance Determination Process, Attachment 1, Phase 1 Operational Checklists, Checklist 7, Refueling Operation with Reactor Coolant Level Above 23'. Accordingly, the finding was determined to be of very low safety significance (Green) because the 1A RHR pump and the Auxiliary Decay Heat Removal (ADHR) system were available, when only one RHR pump was needed per Section I.C of Checklist 7. The cause of this finding was directly related to the cross cutting aspect of Thorough Evaluation of Identified Problems in the Corrective Action Program component of the Problem Identification and Resolution area, because the licensee did not adequately evaluate the precursors related to the degraded 1C RHR motor performance and properly prioritize the resolution of a known condition adverse to quality in time to preclude motor failure [P.1 (c)]. (Section 1R20.1(2))

Inspection Report# : [2010005](#) (pdf)

**Significance:**  Sep 30, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

**Failure to adequately assess online risk associated with maintenance activities on risk significant SSCs**

The inspectors identified a non-cited violation of 10 CFR Part 50.65 (a)(4), for inadequate risk assessments of on-line risk associated with ongoing maintenance activities. Specifically, on July 21 and then again on September 16, 2010, the inspectors found that the licensee failed to perform a probabilistic risk analysis (PRA) evaluation of the multiple

risk significant equipment that had been taken out of service for planned on-line maintenance. The licensee entered this issue into the corrective action program as problem evaluation reports (PERs) 241885 and 254000. In both instances the licensee subsequently performed the required PRA evaluations which determined the on-line risk to be Green.

This finding affected the Mitigating Systems cornerstone and was determined to be greater than minor according to Inspection Manual Chapter (IMC) 0612, Appendix B, Issue Screening, because minor violations of 10 CFR 50.65(a) (4) have occurred repeatedly on five occasions and if continued to be left uncorrected would have the potential to lead to a more significant safety concern. The significance of this finding was evaluated using IMC 0609, Appendix K, Maintenance Risk Assessment and Risk Management Significance Determination Process. Based on Appendix K, the inspectors determined that this finding was of very low safety significance (Green) because the licensee's PRA evaluation concluded the actual risk deficit was less than 1E-6 for the incremental core damage probability deficit (ICDPD) and less than 1E-7 for the incremental large early release probability deficit (ILERPD). The cause of this finding was directly related to the cross cutting aspect of Procedural Compliance in the Work Practices component of the Human Performance area, because the licensee failed to follow the instructions in 0-TI-367 which required a PRA evaluation to be performed in accordance with SPP-9.1 [H.4(b)]. (Section 1R13)

Inspection Report# : [2010004](#) (pdf)

**Significance:**  Sep 30, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

**Failure to perform functional evaluations for gas identified during venting**

An NRC-identified Green non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified for the licensee's failure to perform functional evaluations in accordance with procedure NEDP-22, Functional Evaluations, when gas was identified in the High Pressure Coolant Injection (HPCI) System during the Technical Specification required surveillance. The licensee has subsequently performed functional evaluations of the occurrences and entered the issue into their corrective action program as problem evaluation report (PER) 223067.

This finding was considered more than minor because it adversely affected the Mitigating Systems Cornerstone objective of ensuring the availability and reliability of safety systems, and is related to the attribute of Procedure Quality (i.e.- Maintenance and Testing Procedures). Specifically, the failure to perform a functional evaluation or provide adequate justification for not performing one upon identification of gas during venting of the system could affect the operability, availability, and reliability of the HPCI system or could result in missing an opportunity to identify the source of voiding to preclude future inoperability. This deficiency also paralleled Inspection Manual Chapter 0612, Appendix E, Example 4.a, as the licensee routinely did not perform the required functional evaluations. The team assessed this finding using Inspection Manual Chapter 0609, Significance Determination Process, and determined that the finding was of very low safety significance (Green) because subsequent functional evaluations showed that the gas voids did not impact the operability of the HPCI system.

The cause of this finding was directly related to the cross cutting aspect of Evaluation of Identified Problems in the Corrective Action Program component of the Problem Identification and Resolution area, in that the licensee failed to thoroughly evaluate gas voids such that the resolution addressed causes and extent of conditions, as necessary, and included the failure to thoroughly evaluate for operability and reportability conditions adverse to quality. [P.1(c)] (Section 4OA5)

Inspection Report# : [2010004](#) (pdf)

**Significance:**  Sep 24, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

**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)**

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 40A2.a.3.4)

Inspection Report# : [2010006](#) (pdf)

**Significance:**  Mar 31, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

#### **Failure to effectively maintain performance of the A3 EECW pump as required by 10 CFR**

The inspectors identified a noncited violation of 10 CFR 50.65(a)(2) for failure to demonstrate that the performance of the A3 Emergency Equipment Cooling Water (EECW) pump was effectively controlled by preventive maintenance (PM) such that the pump remained capable of performing its intended function. Also due to inadequate evaluations performed after the A3 EECW pump exceeded its Maintenance Rule a(2) performance criteria, goal setting and monitoring were not established as required by paragraph a(1) of the Maintenance Rule. The licensee subsequently declared the EECW system in (a)(1) status and was in the process of developing the required goals and monitoring plan. This issue was entered into the licensee's corrective action program as problem evaluation report 223404.

The finding was determined to be of greater than minor significance because it was associated with the Equipment Performance attribute of the Mitigating Systems Cornerstone, and adversely affected the cornerstone objective of ensuring availability and reliability of systems designed to respond to initiating events to prevent undesirable consequences. More specifically, the licensee failed to demonstrate effective control of EECW system availability through appropriate PM. According to NRC Inspection Manual Chapter 0609.04, Phase I - Initial Screening and Characterization of Findings, this finding was determined to be of very low safety significance because it did not lead to an actual loss of a system safety function or screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The cause of this finding was directly related to the cross cutting aspect of Thorough Evaluation of Identified Problems in the Corrective Action Program component of the Problem Identification and Resolution area, because the licensee did not adequately evaluate the causes of the A3 EECW pump unavailability and thereby failed to correctly determine the impact on the 10 CFR 50.65(a)(2) unavailability performance criteria [P.1(c)]. (Section 1R12)

Inspection Report# : [2010002](#) (pdf)

**Significance:**  Mar 31, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

#### **Untimely corrective actions to restore compliance of EECW pump in-service testing with ASME OM code requirements**

The inspectors identified a noncited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for failure to promptly recognize, and then correct in a timely manner, non-conforming conditions involving the in-service testing (IST) requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance (OM) of Nuclear Power Plants for the Equipment Cooling Water (EECW) system identified in June

2009. These nonconforming conditions involved the use of flow instrumentation without the proper accuracy, and failure to use the pre-service pump curve when establishing additional IST baseline reference values. The licensee revised the timeliness of their corrective action plans and decided to track this issue as a nonconforming condition. This issue was entered into the licensee's corrective action program as PER 225844.

The finding was determined to be of greater than minor significance because if left uncorrected it could become a more significant safety concern. In-service testing of the EECW system in conformance with the ASME OM Code provides assurance that degraded pump performance would be promptly detected and corrected. Failing to recognize and resolve these and other IST program deficiencies could lead to untimely detection of EECW pump degradation. According to Inspection Manual Chapter 0609.04, Phase I - Initial Screening and Characterization of Findings, this finding was determined to be of very low safety significance because it did not lead to an actual loss of a system safety function or screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The cause of this finding was directly related to the cross-cutting aspect of Appropriate and Timely Corrective Actions in the Corrective Action Program component of the Problem Identification and Resolution area because the licensee failed to take appropriate corrective actions to restore full compliance with the ASME OM Code requirements in a timely manner [P.1(d)]. (Section 40A2.2)

Inspection Report# : [2010002](#) (pdf)

**Significance:** Y Oct 09, 2009

Identified By: NRC

Item Type: VIO Violation

**Failure to Ensure One Train of Cables of Systems Necessary to Achieve and/or Maintain Post-Fire safe Shutdown is Free of Fire Damage in Accordance With 10 CFR Part 50, Appendix R, Section III.G.**

Title 10 of the Code of Federal Regulations (10 CFR), Part 50.48(b)(1) requires that all nuclear power plants licensed to operate prior to January 1, 1979, must satisfy the applicable requirements of 10 CFR Part 50, Appendix R, Sections III.G, III.J, and III.O.

Section III.G requires fire protection of safe shutdown capability.

Section III.G.1 requires fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage, such that one train of systems necessary for achieving and maintaining hot shutdown conditions is free of fire damage.

Section III.G.2 requires, in part, that where cables and equipment of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located in the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided:

- a. separation of cables and equipment by a fire barrier having a 3-hour rating; or
- b. separation of cables and equipment by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. Fire detection and automatic fire suppression shall be installed in the fire area; or
- c. enclosure of cables and equipment of one redundant train in a fire barrier having a 1-hour fire rating. Fire detection and automatic suppression shall be installed in the fire area.

Contrary to the above, since the restart of each unit (Unit 2-1991, Unit 3-1995, Unit 1-2007) and as of January 20, 2010, the date of the inspection report, the licensee had not met nor has met, as of the date of this NOV, the requirements of 10 CFR Part 50, Appendix R, Section III.G, in that:

(i) fire protection features capable of limiting fire damage were not provided for structures, systems, and components important for safe shutdown. Specifically, the Tennessee Valley Authority (licensee) failed to provide fire protection features capable of limiting the fire damage such that one train of systems necessary to achieve and maintain hot shutdown conditions was free from fire damage in Fire Area 8 along with 19 other fire areas designated in the Browns Ferry Fire Protection Report, as required by 10 CFR Part 50, Appendix R, Section III.G.1.

(ii) where cables and equipment of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located in the same fire area, the licensee did not ensure that one of the redundant trains was free of fire damage by providing one of the following means: (a) a 3-hour rated fire barrier; (b) 20 feet of spatial separation (free of intervening combustibles and fire hazards) with detection and suppression installed in the fire area; or (c) a 1-hour rated fire barrier with detection and suppression installed in the fire area. Specifically, cables associated with the RHRSW Pump A1, RHR Pump 1A, and LPCI injection valve 1-FCV-74-53 in Fire Area 1/Fire Zone 1-4 are some of the many examples in which the licensee failed to ensure that one train of cables of redundant systems or equipment necessary to achieve and maintain hot shutdown conditions, located in the same fire area, outside of primary containment was free of fire damage by one of the means described in 10 CFR Part 50, Appendix R, Section III.G.2.

Inspection Report# : [2010007](#) (pdf)  
Inspection Report# : [2009009](#) (pdf)

**Significance:** **W** Oct 09, 2009

Identified By: NRC

Item Type: VIO Violation

### **Inadequate Safe Shutdown Instruction Entry Conditions for Appendix R Fire Events**

The team identified an apparent violation of Technical Specification 5.4.1.a., in that, the licensee's revision to the safe shutdown instruction entry conditions in December 2008 resulted in inadequate procedural guidance. Specifically, the revision to Procedure 0-SSI-001, "Safe Shutdown Instructions," added an entry condition based on the operator's ability to restore and maintain reactor water level above +2 inches on the narrow range scale, utilizing available equipment. This revision could have delayed or prevented entry into the safe shutdown instructions if reactor water level stayed at or above +2 inches on the narrow range scale. Furthermore, this entry condition was not consistent with the initial plant conditions assumed in the fire protection program safe shutdown analysis. The licensee entered this finding into the corrective action program and revised the entry conditions for the safe shutdown instructions on February 27, 2009, to eliminate the +2-inch reactor vessel water level entry condition.

Failure to meet Technical Specification requirements due to inadequate procedural guidance is a performance deficiency. This finding is more than minor because it is associated with the procedure quality attribute of the mitigating systems cornerstone and the inadequate procedure affected the cornerstone objective of protection against external events such as fire to prevent undesirable consequences. Given the number of fire areas involved, a significance determination process Phase 2 analysis was not performed. A regional senior reactor analyst determined that there were significant obstacles to quantifying the risk of this finding because the methods and tools are not adequate to determine the significance of this finding within the established timeliness goal of 90 days. Therefore, the safety significance of this finding was determined using the guidance and qualitative techniques contained in NRC Inspection Manual Chapter 0609, Appendix M, "Significance Determination Process Using Qualitative Criteria." The preliminary significance of this finding was determined to be Greater Than Green, which was reviewed and approved by NRC management. The team determined that this finding did not present an immediate safety concern because the immediate safety hazard no longer existed after the licensee revised the safe shutdown instruction in February 2009. The cause of this finding had a cross-cutting aspect in the Decision Making component of the Human Performance area, in that it was related to the licensee not using conservative assumptions in decision making and not conducting reviews to verify the validity of underlying assumptions and identifying possible unintended consequences (H.1(b)).

Inspection Report# : [2010007](#) (pdf)

Inspection Report# : [2009009](#) (pdf)

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## **Barrier Integrity**

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## **Emergency Preparedness**

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## **Occupational Radiation Safety**

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## **Public Radiation Safety**

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## Physical Protection

Although the NRC is actively overseeing the Security cornerstone, the Commission has decided that certain findings pertaining to security cornerstone will not be publicly available to ensure that potentially useful information is not provided to a possible adversary. Therefore, the [cover letters](#) to security inspection reports may be viewed.

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## Miscellaneous

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