

Browns Ferry 1

2Q/2011 Plant Inspection Findings

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)

Mitigating Systems

Significance:  Jun 30, 2011

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

Failure to take corrective actions to preclude a repetitive functional failure of an EDG due to excessive heat exchanger fouling

A self-revealing non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, was identified for the licensee's failure to take prompt corrective actions to preclude repetition of a significant condition adverse to quality (SCAQ) that resulted in the loss of a emergency diesel generator (EDG) safety function due to excessive heat exchanger fouling. On August 4, 2010 the licensee identified a SCAQ due to excessive fouling of the Unit 1/2 D EDG heat exchangers which resulted in a functional failure of the D EDG. Prompt corrective actions were not taken to preclude repetition because on June 5, 2011, excessive fouling was identified on the 3D EDG heat exchangers which resulted in a functional failure of the 3D EDG. Corrective actions taken by the licensee included cleaning and returning the 3D EDG heat exchangers to an operable status, and increasing monitoring of emergency equipment cooling water (EECW) cooling flow to all the EDG heat exchangers from weekly to every two days. The licensee entered this issue into their corrective action program as problem evaluation report (PER) 381569.

This finding was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the excessive fouling of the 3D EDG heat exchanger was a functional failure and resulted in unplanned unavailability of the 3D EDG. In accordance with Inspection Manual Chapter (IMC) 0609 Attachment 4, Phase I - Initial Screening and Characterization of Findings, this finding was determined to be of very low safety significance because it did not represent an actual loss of safety function of a single train for more than its technical specification allowed outage time of seven days, 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 Maintaining Long Term Plant Safety (Equipment Issues) in the Resources component of the Human Performance area because of the licensee's failure to minimize the duration of a long-standing degraded equipment issue related to relic clam shells in the EECW system which resulted in a repetitive functional failure of an EDG due to excessive heat exchanger fouling. [H.2.(a)]. (Section 1R07)

Inspection Report# : [2011003](#) (pdf)

Significance:  Jun 30, 2011

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

Over-pressurization of high pressure coolant injection system due to stuck open HPCI system testable check valve

A self-revealing non-cited violation of 10 CFR 50 Appendix B, Criteria XVI, Corrective Action, was identified for the licensee's failure to promptly correct a condition adverse to quality related to Unit 1 High Pressure Coolant Injection (HPCI) system testable check valve which resulted in over-pressurization and significant damage to the HPCI system. Specifically, binding of the actuator linkage connected to the valve disc shaft caused the valve disc to physically stick open following a HPCI injection event. Subsequent opening of the inboard HPCI injection valve in preparation for a routine HPCI venting evolution resulted in over-pressurization of the HPCI system. The licensee repaired the damage to the HPCI system and temporarily modified the valve actuator linkage to remove any potential for binding until more permanent repairs could be performed in a unit outage. The licensee entered this issue into their corrective action program as problem evaluation report (PER) 372659.

This finding was determined to be more than minor because it was associated with the Mitigating Systems Cornerstone attribute of Equipment Performance, and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e. core damage). Specifically, the stuck open testable check valve resulted in over-pressurization of the HPCI system, significant damage to HPCI components, and loss of the HPCI function. In accordance with Inspection Manual Chapter (IMC) 0609 Attachment 4, Phase I - Initial Screening and Characterization of Findings, this finding was determined to be of very low safety significance because it did not represent a loss of system safety function or screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. The Automatic Depressurization System (ADS) was available at all times to support the coolant injection safety function. 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 of the licensee's inadequate evaluation of PER 289169 for the abnormal check valve actuator open indication that subsequently resulted in an over-pressurization and loss of function of the Unit 1 HPCI system [P.1.(c)]. (Section 1R15)

Inspection Report# : [2011003](#) (pdf)

Significance: G 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: R Oct 23, 2010

Identified By: Self-Revealing

Item Type: VIO Violation

RHR subsystem inoperable beyond the TS allowed outage time

Browns Ferry Nuclear Plant Unit 1 Technical Specification (TS) LCO 3.5.1, Emergency Core Cooling System (ECCS) - Operating, requires, in part, that each ECCS injection/spray subsystem shall be operable in Modes 1, 2 and 3. Action statement Condition A states that with one low pressure ECCS injection/spray subsystem inoperable, restore

the low pressure ECCS injection/spray subsystem to operable status with seven days. Action statement Condition B states that with the required action and associated completion time of Condition A not met, be in Mode 3 within 12 hours and in Mode 4 within 36 hours.

Contrary to the above, from March 13, 2009, to October 23, 2010, a Unit 1 low pressure ECCS injection/spray subsystem was inoperable while in Modes 1, 2 and 3, and the licensee failed to restore the subsystem to operable status within seven days, or complete Action statement Condition A and B within the required time. Specifically, the Unit 1 Residual Heat Removal Loop II subsystem was inoperable, because the licensee failed to maintain the Unit 1 outboard Low Pressure Coolant Injection (LPCI) valve 1-FCV-74-66 in an operable condition, which rendered a low pressure ECCS injection/spray subsystem (the RHR loop II subsystem) inoperable while Unit 1 was operating in Mode 1.

Inspection Report# : [2011008](#) (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 40A5)

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*)

Barrier Integrity

Significance:  Mar 31, 2011

Identified By: NRC

Item Type: NCV NonCited Violation

Inadequate TS 5.5.2 program for primary coolant leaks outside containment

An NRC identified non-cited violation of Technical Specifications (TS) 5.5.2, Primary Coolant Sources Outside Containment was identified for the licensee's failure to establish, implement, and maintain an adequate program for minimizing primary coolant leaks from systems (i.e., Core Spray, Residual Heat Removal, High Pressure Coolant Injection, and Reactor Core Isolation Cooling) outside containment, that could contain highly radioactive fluids during a serious transient or accident, to levels as low as practicable. The licensee's corrective actions included identification, evaluation, and prioritization of all known primary coolant leaks outside containment; and development of a new program in accordance with 0-TI-578, Minimizing Primary Coolant Sources Outside Containment. This finding was

entered into the licensee's corrective action program as problem evaluation report (PER) 317464.

This finding was determined to be more than minor because if left uncorrected it could have led to a more significant safety concern. Specifically, the licensee's failure to effectively minimize and monitor primary coolant leakage outside containment could have resulted in increased main control room exposure and/or offsite dose during an accident due to excessive radioactive fission product releases into secondary containment. The finding was determined to be of very low safety significance (Green) according to IMC 0609, Appendix H, Containment Integrity Significance Determination Process, Section 6.0, Type B Findings, because the primary coolant leak rate into secondary containment was a small fraction of the leakage assumed in the design basis accident (DBA) safety analyses. The cause of this finding was directly related to the cross-cutting aspect Complete and Accurate Procedures in the Resources component of the Human Performance area because the licensee's existing procedures were inadequate and incomplete for addressing the program requirements of TS 5.5.2 [H.2.(c)]. (Section 4OA2.5)

Inspection Report# : [2011002](#) (*pdf*)

Emergency Preparedness

Occupational Radiation Safety

Public Radiation Safety

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.

Miscellaneous

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