

Browns Ferry 1

3Q/2011 Plant Inspection Findings

Initiating Events

Significance:  Sep 30, 2011

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to control transient combustible materials in the Unit 1 reactor building

A NRC-identified non-cited violation of the Technical Specifications 5.4.1.d, Fire Protection Program Implementation, was identified for the licensee's failure to control transient combustible materials in a designated exclusion area between Fire Zones 1-1 and 1-2 in the Unit 1 reactor building. Specifically, on August 12, 2011, the inspectors identified transient combustible materials left unattended in the designated exclusion area between Loops I and II of the low pressure coolant injection (LPCI) system following LPCI injection valve maintenance activities. Upon notification by the inspectors, the licensee promptly removed the materials. This issue was entered into the licensee's corrective action program as problem evaluation report (PER) 418101.

The finding was determined to be greater than minor because it was similar to example 4.k. of Inspection Manual Chapter (IMC) 0612, Appendix E, for an issue of concern involving transient combustibles in a designated combustible free area required for separation of redundant safe shutdown trains. The safety significance of the finding was characterized using IMC 0609, Significance Determination Process (SDP), Appendix F, Attachment 1, Fire Protection SDP Phase 1 Worksheet, and determined to be of very low safety significance because of a low degradation rating since a roving fire watch was already established in this same area for another fire impairment while the transient combustibles were left unattended. The cause of this finding was directly related to the cross cutting aspect of effectively communicating expectations regarding procedural compliance in the Work Practices component of the Human Performance area, because the expectations for the removal of combustible materials from this area were not effectively communicated to the night shift personnel [H.4(b)]. (Section 1RO5.1)

Inspection Report# : [2011004](#) (*pdf*)

Significance:  Sep 30, 2011

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

Unit 1 loss of shutdown cooling caused by emergency diesel generator output breaker trip

A self-revealing non-cited violation of Technical Specifications 5.4.1.a was identified for the licensee's failure to establish an adequate maintenance procedure to ensure appropriate calibration and alignment of the Emergency Diesel Generator (EDG) overspeed trip limit switch (OTLS) arm. The lack of procedure guidance resulted in an improperly adjusted OTLS that caused a premature trip of the A EDG output breaker and loss of Unit 1 shutdown cooling (SDC) on May 2, 2011. The licensee replaced and properly set the OTLS on the A EDG, verified the OTLS setpoint on all other seven EDGs, and initiated revisions to applicable maintenance procedures. This issue was entered into the licensee's corrective action program as problem evaluation report (PER) 362340.

The finding 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 shutdown. Specifically, the misadjusted A EDG OTLS resulted in a premature trip of the A EDG output breaker and a loss of Unit 1 SDC. According to Inspection Manual Chapter (IMC) 0609, Significance Determination Process (SDP), Appendix G, Shutdown Operations, Table 1, Losses of Control, the safety significance of the finding was initially characterized to be potentially greater than very low safety significance because the inadvertent loss of SDC represented a loss of control due to a loss of thermal margin to boiling greater than 20 percent. However, a Phase 3 analysis was performed by a Senior Reactor Analyst, it was determined the loss of SDC event was of very low risk significance (i.e., Green), due in part to a low change in risk because of a high chance of recovery of offsite power before the duration of time required to cause the EDG to trip, and the likelihood of recovery of the tripped EDG. The cause of this finding was directly

related to the cross-cutting aspect of appropriate self assessments in the Self and Independent Assessments component of the Problem Identification and Resolution area, because inadequate technical rigor applied by the licensee to recognize single point system vulnerabilities resulted in inadequate procedural guidance for maintenance personnel to appropriately calibrate and align the OTLS switch arm and overspeed trip lever [P.3.(a)]. (Section 40A3.2)

Inspection Report# : [2011004](#) (*pdf*)

Significance: G 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: TBD Sep 30, 2011

Identified By: Licensee

Item Type: AV Apparent Violation

Failure to properly install Unit 1 high pressure coolant injection booster pump outboard bearings

A licensee-identified apparent violation of Technical Specifications 5.4.1.a was identified for the licensee failing to establish an adequate maintenance instruction for properly installing the Unit 1 High Pressure Coolant Injection (HPCI) booster pump outboard bearing. On July 20, 2011, visual inspections confirmed the booster pump outboard bearing was installed incorrectly and exhibited severe damage. The licensee replaced the HPCI booster pump outboard bearing and the issue was entered into the licensee's corrective action program as problem evaluation reports (PER) 405165 and 408067.

The finding was determined to be greater than minor because it was associated with the Mitigating Systems Cornerstone attributes of Equipment Performance and Procedure Quality, 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 work package to replace the HPCI booster pump outboard bearing did not include sufficiently detailed instructions to ensure that the bearings were installed in the correct back to back arrangement. Failure to correctly install the HPCI booster pump bearing resulted in severe bearing damage that would have eventually led to a failure of the Unit 1 HPCI pump. The significance of this finding was characterized using Inspector Manual Chapter (IMC) 609, Significance Determination Process (SDP), Attachment 04, Phase 1 - Initial Screening and Characterization of Findings, which did not screen as Green for the Mitigating Systems Cornerstone because it involved a loss of system safety function. A further characterization of the safety significance was then performed using IMC 609, Appendix A, Determining the Significance of Reactor Inspection Findings for At-Power Situations. The Phase 2 SDP of Appendix A determined the finding to be potentially greater than very low safety significance (Green) based on the Browns Ferry Phase 2 pre-solved table.

Since this finding was potentially greater than Green it will necessitate a Phase 3 SDP to characterize the safety significance. Because the safety significance of this finding has not been finalized, it will be designated as To Be Determined (TBD). No crosscutting aspect was assigned because the incorrect bearing installation did not occur within the past three years, and therefore, was not reflective of current licensee performance. (Section 1R22)

Inspection Report# : [2011004](#) (pdf)

Significance: G 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: G 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*)

Barrier Integrity

Significance: G 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 40A2.5)

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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