



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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ATLANTA, GEORGIA 30303-8931

December 22, 2008

Mr. William R. Campbell, Jr.
Chief Nuclear Officer and Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT - NRC PROBLEM IDENTIFICATION AND
RESOLUTION INSPECTION REPORT 05000259/2008007, 05000260/2008007
AND 05000296/2008007

Dear Mr. Campbell:

On October 24, 2008, 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 findings, which were discussed on October 24 and December 17, 2008, with Mr. R. West and Mr. S. Bono, respectively and other members of your staff.

The inspection was an examination of activities conducted under your licenses as they relate to the identification and resolution of problems, and 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 with personnel.

On the basis of the samples selected for review, the team concluded that in general, your corrective action program processes and procedures were adequate; thresholds for identifying issues were appropriate; and problems were generally evaluated and corrected within the problem identification and resolution program (PI&R). However, several instances were identified where corrective actions were not effective. Additionally, the team determined your corrective actions implemented to date, and scheduled to be implemented, to address the substantive cross-cutting issue in the area of problem identification and resolution were appropriate; however, we have noted that additional corrective actions may be determined from ongoing root cause efforts in this area.

This report documents one NRC-identified finding which was determined to involve a violation of NRC requirements. Additionally, one licensee-identified violation which was determined to be of very low safety significance is listed in this report. However, because of the very low safety significance and because it was entered into your corrective action program, the NRC is treating

the finding as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC's Enforcement Policy. If you contest any NCV 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 Resident Inspector at the Browns Ferry Nuclear Plant.

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/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Steven J. Vias, Chief
Reactor Projects Branch 7
Division of Reactor Projects

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

Enclosure: Inspection Report 05000259/2008007, 05000260/2008007, and
05000296/2008007

w/Attachments: 1. Supplemental Information

cc w/encl: (See page 3)

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Letter to William R. Campbell, Jr. from Steven Vias dated December 22, 2008

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U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 05000259, 05000260, 05000296

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

Report No.: 05000259/2008007, 05000260/2008007 and 05000296/2008007

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: September 29 – October 3, 2008
October 20 – 24, 2008

Inspectors: D. Merzke, Senior Project Engineer, Team Leader
S. Atwater, Senior Project Inspector
J. Rivera-Ortiz, Senior Project Inspector
R. Taylor, Senior Project Inspector
C. Stancil, Resident Inspector, Browns Ferry
D. Mas-Peñaranda, Reactor Inspector

Approved by: Steven J. Vias, Chief
Reactor Projects Branch 7
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000259/2008007, 05000260/2008007 and 05000296/2008007; 9/29/2008 – 10/24/2008; Browns Ferry Nuclear Plant, Units 1, 2 and 3; biennial inspection of the identification and resolution of problems.

The inspection was conducted by a senior project engineer, three senior project inspectors, a reactor inspector and a resident inspector. One Green finding of very low safety significance was identified during this inspection and was classified as a non-cited violation (NCV). The significance of most findings is indicated by their color (i.e., Green, White, Yellow, or Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). 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.

Identification and Resolution of Problems

The team concluded that, in general, problems were identified, evaluated, prioritized, and corrected. The licensee was adequate at identifying problems and entering them into the corrective action program (CAP) for resolution. The licensee maintained a reasonable threshold for identifying problems as evidenced by the large number of Problem Evaluation Reports (PERs) entered annually into the CAP, management expectation that all personnel are encouraged to initiate a PER for any deficiency noted, and CAP procedures requiring all personnel initiate PERs to document Significant Conditions Adverse to Quality (SCAQs), Conditions Adverse to Quality (CAQs), and potential items for improvement. However, some deficiencies were identified by the inspection team of issues not previously entered into the CAP. Generally, the licensee prioritized and evaluated issues, formal root cause evaluations for significant problems were adequate, and corrective actions specified for problems were acceptable. Overall, corrective actions developed and implemented for issues were generally effective. However, the team also identified examples where corrective actions were not effective.

The team determined that overall, audits and self-assessments were adequate in identifying deficiencies and areas for improvement in the CAP, and generally, appropriate corrective actions were developed to address these issues. Operating experience usage was found to be generally acceptable and integrated into the licensee's processes for performing and managing work, and plant operations. However, the team found examples where operating experience was not adequately addressed.

Based on discussions and interviews conducted with plant employees from various departments, the inspectors did not identify any reluctance by workers to report safety concerns, or utilize the corrective action program.

The team determined that corrective actions implemented, and planned to be implemented, to address the substantive cross-cutting issue in problem identification and resolution identified by the NRC in its annual assessment letter dated March 3, 2008, were appropriate. The team

Enclosure

noted that the only corrective action to prevent recurrence for one of the common causes may not be sufficient to prevent recurrence. However, there were several other corrective actions credited from other PERs already implemented to address this common cause which the team considered to be appropriate. Additionally, a root cause evaluation team has been chartered to determine if any other corrective actions should be taken.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

Green. An NRC-identified, Green, non-cited violation of 10 CFR 50, Appendix B, Criterion II, "Quality Assurance Program," was identified for the licensee's failure, between April 2000 and January 2008, to carry out the Nuclear Quality Assurance Plan policy in that trend analysis performed on adverse conditions did not result in trend results which identified vibration-induced, failed or degraded residual heat removal (RHR) heat exchanger (Hx) service water (SW) outlet flow control valves (FCVs) as an adverse trend that needed increased management attention. Between April 2000 and January 2008, there were 17 instances of failed or degraded Unit 2 and 3 RHR Hx SW outlet FCVs due to vibration-induced damage entered into the licensee's corrective action program (CAP). This issue has been identified in the licensee's CAP as PER 159606. Corrective actions associated with the vibration-induced damage included actions to replace Units 2 and 3 RHR Hx SW outlet FCVs with the same valves used on Unit 1 and to reconfigure all three units with a smaller bypass valve around the RHR Hx SW outlet FCVs.

This finding was more than minor because it affected the Mitigating System cornerstone objective of ensuring the reliability of systems that respond to initiating events to prevent undesirable consequences and the cornerstone's attribute of equipment performance. Using the Significance Determination Process, the finding was determined to be of very low safety significance due to the RHR Hx SW outlet FCV occurrences, in which the RHR Hx SW outlet FCVs would not perform their safety function, did not represent an actual loss of a safety function of a single RHR SW train for greater than its Technical Specification allowed outage time. The cause of this finding was directly related to the Trend Performance in the CAP cross-cutting aspect of the Problem Identification and Resolution cross-cutting area, in that, the licensee failed to properly assess information in their CAP to identify the common cause problem of vibration-induced degraded and inoperable RHR Hx SW outlet FCVs.(P.1(b)). (Section 4OA2.f)

B. Licensee-Identified Violations

One violation of very low safety significance was identified by the licensee and has been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. The violation is discussed in Section 4OA7 of this report.

REPORT DETAILS

.4 OTHER ACTIVITIES (OA)

4OA2 Problem Identification and Resolution

The team based the following conclusions, in part, on issues identified during the period of August 25, 2007 through October 24, 2008. In addition, the team reviewed age-dependent issues for selected systems identified in the past five years.

a. Assessment of the Corrective Action Program (CAP)

(1) Inspection Scope

The inspectors reviewed the licensee's CAP procedures which described the administrative process for initiating and resolving problems primarily through the use of problem evaluation reports (PERs). The inspectors reviewed selected PERs, verified corrective actions were implemented, and attended meetings where PERs were screened for significance to determine whether the licensee was identifying, accurately characterizing, and entering problems into the CAP at an appropriate threshold.

The inspectors selected PERs for review which involved issues covering the seven cornerstones of safety identified in the NRC's Reactor Oversight Process (ROP). The selected samples involved various licensee classified severity levels and site departments. These PERs were reviewed to assess each department's threshold for identifying and documenting plant problems, thoroughness of evaluations, and adequacy of corrective actions. The inspectors also conducted a detailed review of PERs for risk significant systems which were selected based on risk insights from the licensee's probabilistic safety assessment and discussions with the Senior Resident Inspector. The systems selected for review included the Emergency Equipment Cooling Water system (EECW), Emergency Diesel Generators (EDG), Control Rod Drive (CRD) Injection system, and 480 VAC circuit breakers. The inspectors reviewed PERs, maintenance history, completed work orders (WOs) for the systems, and reviewed associated system health reports. These reviews were performed to verify that problems were being properly identified, appropriately characterized, and entered into the CAP. Items reviewed generally covered a one-year period of time; however, in accordance with the inspection procedure, a five-year review was performed for selected systems for age-dependent issues.

The inspectors conducted plant walkdowns of equipment associated with the selected systems to assess the material condition and to look for any deficiencies that had not been entered into the CAP. Control Room walkdowns were also performed to assess the main control room (MCR) deficiency list and to ascertain if deficiencies were entered into the CAP. Operator Workarounds and Operator Burdens screenings were reviewed and the inspectors verified compensatory measures for deficient equipment were being implemented in the field. The inspectors reviewed PERs, including root and apparent cause evaluations, site and department trend reports, and observed other activities, and verified that the licensee appropriately prioritized and evaluated problems in accordance with their risk significance. The review was to verify that the licensee determined the cause of the problems, including root cause analysis where appropriate, and addressed operability, reportability, common cause, generic concerns, and extent of condition.

The review included the appropriateness of the assigned significance, the timeliness of resolutions, the level of effort in the investigation, and the scope and depth of the causal analysis. The review also assessed if the licensee had appropriately identified and prioritized corrective actions to prevent recurrence.

The inspectors reviewed 174 PERs encompassing all priorities, and 42 work orders initiated to resolve PERs to verify the licensee had identified and implemented timely and appropriate corrective actions to address problems. The inspectors verified that the corrective actions were properly assigned, documented, and tracked to ensure completion. The review was also conducted to verify the adequacy of corrective actions to address equipment deficiencies and maintenance rule (MR) functional failures of risk significant plant safety systems.

The inspectors attended various plant meetings to observe management oversight functions of the corrective action process. These included PER Screening Committee (PSC) meetings, Corrective Action Review Board (CARB) meetings, and PER Closure Review Board (CRB) meetings.

Furthermore, the inspectors verified that issues identified by internal and external operating experience, licensee audits and self-assessments, and the concerns resolution program were entered into and dispositioned by the CAP, as appropriate. The team also reviewed corrective action packages related to previously issued non-cited violations and licensee event reports.

Documents reviewed are listed in the Attachment.

(2) Assessment

Identification of Issues

The team determined that the licensee was generally effective in identifying problems and entering them into the CAP. There was a low threshold for entering issues into the CAP and employees were encouraged to initiate PERs for any reason. Trending was generally effective in monitoring equipment performance. Site management was actively involved in the CAP and focused appropriate attention on significant plant issues.

Based on reviews and walkdowns of accessible portions of the selected systems, the inspectors determined that system deficiencies were being identified and placed in the CAP. However, during the walkdown of the EDG system, the inspectors identified several issues that had not been previously entered into the CAP. They included: the air intake filter for the 3C EDG showed coating degradation in the filter internals (PER 155137 initiated); corrosion on the "A", "C", and "3B" exhaust expansion joints (PER 155144 initiated); the "3C" air start motor exhaust lines were found to be loose (PER 155155 initiated); the expansion joint bolts on the B EDG exhaust pipe showed excessive oil (PER 155158 initiated). The team determined the issues identified did not impact the availability or reliability of the EDGs.

The team had the following additional observations related to identification of issues:

- Documentation to verify the qualification of a PSC member was missing. The inspectors subsequently determined the member had completed the certification requirements. The licensee completed the required documentation.
- While performing a walkdown of the intake structure, the inspectors questioned the compensatory measures taken related to the "A" EECW strainer which was de-energized because of a failed EECW strainer drain valve. The inspectors determined the only action taken was to hang a Caution tag on the "A3" EECW pump switch in the control room, but the licensee failed to initiate a Priority 2 operator workaround as required by OPDP-1, "Conduct of Operations." This failure to comply with the licensee's operating procedures constitutes a violation of minor significance that is not subject to enforcement action in accordance with the NRC's Enforcement Policy. The licensee initiated the Priority 2 operator workaround and generated PER 155157 to address this issue.

Prioritization and Evaluation of Issues

Based on the review of audits conducted by the licensee and the assessment conducted by the inspection team during the onsite period, the team concluded that problems were generally prioritized and evaluated in accordance with the licensee's CAP procedures as described in the condition classification guidance in PIDP-4, "Corrective Action Program Screening and Oversight," Appendix A. Each PER written was assigned a priority level at the PSC meeting, which was chaired by the Performance Improvement Manager. Management reviews of PERs conducted by the CARB were thorough, and adequate consideration was given to system or component operability and associated plant risks. However, the team did identify examples where PERs were not evaluated consistent with CAP guidance, or evaluations were not completed in a timely manner:

- PER 140683 concerning several items that were stamped and identified as "sensitive" at Browns Ferry was reviewed by the Management Review Committee (MRC) on March 24, 2008. CAP procedures state a goal of 30 days to develop a corrective action plan and obtain approvals, and extensions may be approved. The first extension for this PER was requested on August 18, 2008, almost 5 months after the PER was reviewed by the MRC.
- PER138856 (Category C/Apparent Cause Analysis) documented the inoperability of the "B" EDG due to a leak in the jacket water heat exchanger (HX), which was the second occurrence in seven days. The PER stated that had the original work order been planned for Eddy Current Testing (ECT), the tubes with thinned walls would likely have been identified and plugged, which would have precluded the second tube leakage. The inspectors found that the licensee did not evaluate the part of the problem description which recommended ECT for potential corrective actions. The licensee initiated PER 155342 to address the inspector's observation.

Effectiveness of Corrective Actions

Based on a review of corrective action documents, interviews with licensee staff, and verification of completed corrective actions, the team determined that overall, corrective actions were adequate in correcting plant problems in that conditions adverse to quality were promptly identified and corrected, and that generally, corrective actions

implemented by the licensee were appropriate for the risk significance of the problem identified. However, the team identified some examples of process deficiencies and corrective actions that were not effective. For significant conditions adverse to quality, the corrective actions directly addressed the cause and effectively prevented recurrence in that a review of performance indicators, all PERs, and effectiveness reviews demonstrated that the significant conditions adverse to quality had not recurred. The team made the following observations:

- PER 141502, initiated to track response and actions to recommendations from Nuclear Assurance audit SSA0802 of the station Security department, was closed out to future actions, contrary to guidance in PIDP-9, PER Closure, which stated “PERs not involving hardware which are to be resolved through issuance of new or revised procedures or design output documents may be closed when the affected procedures or design output documents have been approved, AND an acceptable date has been established and approved when full implementation shall be complete.” The revised procedures had not been approved at the time the corrective action was closed. The licensee initiated PER 153836 to address this issue. The inspectors determined through interviews with licensee staff that the actions had been completed as proposed.
- PER 132649 was initiated to address deficiencies in Browns Ferry's Organizational Effectiveness at identifying and correcting performance shortfalls. The only corrective action to prevent recurrence (CATPR) was the development and implementation of a Turnaround Plan to Excellence. Corrective actions associated with the Turnaround Plan were developed and implemented outside the formal CAP process. Because the corrective actions were implemented outside the CAP process, documentation was unavailable to verify that actions were complete. The licensee initiated PER 153900 to address the issue of implementing the actions of the Turnaround Plan outside the CAP. The inspectors subsequently verified, by sampling, that corrective actions developed have been placed into the CAP.
- PER 136489 was initiated to evaluate and correct the common causes related to the substantive cross-cutting issue in problem identification and resolution. For the common cause identified as “inadequate management and supervisor oversight and failure to reinforce standards and expectations,” the only corrective action to address the cause was a memo to all supervisors, which was not a sustainable CATPR. Based on interviews with licensee management, the inspectors determined the memo on management expectations would be periodically reissued as part of their new program. The significance was mitigated in that the inspectors determined additional corrective actions from related PERs could be credited to address the cause. The corrective actions credited but not referenced in PER 136489 were 138724-001, 132649-021, and 132649-022. The PSC identified this vulnerability of not linking credited corrective actions in their process guidance through an audit and initiated PER 155088 to address this issue, and immediate corrective action was taken to reference the credited corrective actions in this PER.

- PER 129342 was initiated to document the entry of the RHR and Core Spray room coolers into MR (a)(1) status due to train failures (reduction in reliability) and excessive unavailability. The inspectors concluded that some of the corrective actions did not address the causes identified as required by licensee procedure PIDP-9, PER Closure, Appendix A. The following examples were identified:
 - Action No. 28 required the evaluation of acceptance criteria for the differential pressure (dP) across the cooling coils in procedure 1/2/3-TI-134. This action was generated to address an apparent cause, which stated that TI-134 lacked acceptance criteria for dP across the air coolers which resulted in inadequate air flow test specifications. However, the action taken did not generate any acceptance criteria as stated by the proposed corrective action. Instead, the corrective action taken stated that the system engineer records and evaluates the dP data and identifies adverse trends, as a current practice, and then closed. Licensee procedure PIDP-9, "PER Closure," stated "If the corrective actions taken are different from the approved corrective actions, the CAP should be revised by backrouting and revising the action."
 - Actions 27 and 29 were generated to address one of the apparent causes which stated that the Air Flow Testing method was not optimized which resulted in excessive time to perform the flow test in procedure TI-134. The resultant optimization was an enhancement recommended to reduce unavailability time. However, the actions taken were the only actions credited to address the apparent cause, but they did not implement any measures to optimize the Air Flow Test Method.
- During the review, the team determined the licensee identified a similar issue in this area, documented in PER 133647, a Category B Root Cause for Reactivity Management Events. It contained corrective actions that did not clearly address the root cause analysis results. The barrier analysis identified aging issues with components, specifically buffer cards in the CRD system. However, no clear corrective action was developed from this PER to address this cause. The licensee identified two hundred sixty days later in PER 153202 that the obsolescence of the CRD system components had not been addressed.

Some PERs were identified by the team as having corrective actions that were not completed in a timely manner commensurate with the complexity and/or importance of the corrective actions, i.e., the corrective actions required more than 180 days to complete. Corrective actions requiring more than 180 days to complete should be designated as "long-term corrective actions" in accordance with licensee CAP procedures. PER 114298 addressed 25-Unit 2 CRD thermocouples disabled due to intermittent alarms from failing connections. New adaptors were scheduled to be installed during the last Unit 2 outage, but were removed from the schedule. The next opportunity to repair is the next Unit 2 outage, incurring a 2-year delay for the corrective action. PER 134284 documented that the Unit 1 CRD air headers were unsupported, creating a potential reactor trip issue during manipulation of valves in this line. WO 07-726501-000 was initiated on November 28, 2007 and assigned a 3E priority, to fix within 12 weeks.

The work order was deferred and scheduled to be completed December 15, 2008, over 1-year after being designated as “fix within 12 weeks.” Although the licensee acted within their process, the team determined that deferring the work over a year for a potential reactor trip issue had not meet the intent of the licensee’s process.

(3) Findings

No findings of significance were identified.

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

(1) Inspection Scope

The team examined licensee programs for reviewing industry operating experience, reviewed the licensee’s operating experience database, and interviewed the OE Coordinator, to assess the effectiveness of how external and internal operating experience data was handled at the plant. In addition, the team selected operating experience documents (e.g., NRC generic communications, 10 CFR Part 21 reports, licensee event reports, vendor notifications, and plant internal operating experience items, etc.), which had been issued since August 25, 2007, to verify whether the licensee had appropriately evaluated each notification for applicability to the Browns Ferry plant and whether issues identified through these reviews were entered into the CAP. Documents reviewed are listed in the Attachment.

(2) Assessment

Based on interviews with the OE coordinator and a review of documentation related to review of operating experience issues, the team determined that the licensee was effective in screening operating experience for applicability to the plant in that no events occurred which could have been prevented by the use of OE. The inspectors verified that the licensee had entered those items determined to be applicable into the CAP and taken adequate corrective actions to address the issues. Operating experience was utilized and considered as part of formal root cause evaluations for supporting the development of lessons learned and corrective actions for CAP issues. The team noted the following examples where operating experience was not effectively utilized:

- Operations, Engineering, and Chemistry departments were unaware that supervisors were responsible to ensure the Nuclear Network Daily Download was routinely reviewed to identify events related to their areas of responsibility and whether the potential for a similar event may exist, in accordance with procedure SPP-3.9, “Operating Experience.” However, the site operating experience coordinator ensured applicable OE was evaluated and disseminated to all departments. The licensee initiated PER 154970 to address this issue.
- PER 149942 was initiated for the 4 KV cooling tower bus failure. The preventive maintenance (PM) program in place had no specified frequency. The licensee identified in their evaluation that industry practice for switchgear bus maintenance indicated a maintenance interval of 6-12 years to be appropriate for this equipment in accordance with “Bus Maintenance Industry Info D-40” and “NMAC Power Transformer Maintenance and Application Guide.”

- The licensee included a corrective action in PER 149942 to revise the PM scope and frequency so that maintenance activities are complete and in accordance with the latest industry practices.
- PER 140874 was initiated as a result of a personnel injury while moving a heavy load. The team reviewed guidance document BP-250, "Corrective Action Program Handbook," in effect at the time, and determined the licensee did not consider external operating experience in the root cause evaluation as specified in the guidance. PER 155321 was initiated to address this issue.

(3) Findings

No findings of significance were identified.

c. Assessment of Self-Assessments and Audits

(1) Inspection Scope

The inspectors reviewed licensee Quality Assurance (QA) audits conducted by the Nuclear Assurance Department, and department self-assessments, including those which focused on problem identification and resolution, to verify that findings identified in the audits were entered into the CAP.

(2) Assessment

QA audits and departmental self-assessments were effective in identifying issues and directing attention to areas that needed improvement. Licensee identified weaknesses and issues in self-assessments were entered into the corrective action program and appropriately addressed. The team determined that the self-assessments and audits were critical and insightful at identifying issues and entering them into the corrective action program, e.g., they consistently identified problems such as inadequate management and supervisory oversight. The team reviewed the licensee's corrective actions associated with this issue and documented observations in the assessment of effectiveness of corrective actions and the assessment of progress in addressing the substantive cross-cutting issue. The team determined the self-assessments were thorough and comprehensive.

(3) Findings

No findings of significance were identified.

d. Assessment of Safety-Conscious Work Environment

(1) Inspection Scope

The team randomly interviewed 25 on-site workers regarding their knowledge of the corrective action program at Browns Ferry and their willingness to write PERs or raise safety concerns. During technical discussions with members of the plant staff, the inspectors conducted interviews to develop a general perspective of the safety-conscious work environment at the site. The interviews were also conducted to 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) and interviewed the CRP coordinator. Additionally, the inspectors reviewed a sample of completed CRP reports to verify that concerns were being properly reviewed and identified deficiencies were being resolved and entered into the CAP when appropriate.

(2) Assessment

Based on this inspection and the PER reviews, the team determined that licensee management emphasized the need for all employees to identify and report problems using the appropriate methods established within the administrative programs, including the CAP and CRP. These methods were readily accessible to all employees. Based on discussions conducted with a sample of plant employees from various departments, the inspectors determined that employees felt free to raise issues and felt that management encouraged employees to place issues into the CAP for resolution. The inspectors did not identify any reluctance on the part of the licensee staff to report safety concerns.

(3) Findings

No findings of significance were identified.

e. Assessment of Progress in Addressing the Substantive Cross-Cutting Issue

(1) Inspection Scope

The inspectors reviewed the licensee's corrective actions related to the substantive cross-cutting issue in problem identification and resolution related to taking appropriate corrective actions to address safety issues and adverse trends in a timely manner, commensurate with their safety significance and complexity, as documented in PER 136489, initiated on January 14, 2008. The review included the licensee's root cause and common cause analyses, as well as a verification of the corrective actions that have been implemented, or scheduled to be implemented, to address each of the causes.

(2) Assessment

The licensee's analyses identified three common causes associated with the substantive cross-cutting issue.

Common Cause 1 stated the "Corrective Action Program procedures lack sufficient detail and/or guidance for proper implementation of the program in several areas." The team determined that the licensee implemented several corrective actions to prevent recurrence, including the revision of all CAP procedures and several maintenance and plant procedures. These actions realigned the PER prioritization process, provided additional guidance concerning apparent and root cause evaluations, as well as extent of condition and extent of cause evaluations, and a requirement to initiate PERs for corrective maintenance. Additionally, guidance was revised to ensure work orders implementing corrective actions could not be cancelled or rescheduled without CARB or PSC concurrence. The corrective actions also included a process to update the CAP governance documents regularly. The inspectors reviewed all revised procedures and verified that each corrective action was implemented as proposed in the corrective action plan and was consistent with the common cause evaluation.

The team determined the corrective actions taken to address this common cause were appropriate in that they improved guidance for implementing the program and were focused on ensuring the licensee follows through in implementing appropriate corrective actions.

Common Cause 2 stated that “management oversight and reinforcement of standards with respect to the Corrective Action Program was less than adequate. This includes: accountability, weak processes that support management oversight, and leadership by example by senior management in the CAP process.” The team determined the licensee implemented several corrective actions to focus management and supervisor attention on improved oversight and reinforcement of standards. A PSC and a separate CARB were established to focus management more on an oversight role. In addition, the site Vice President issued a letter to and conducted meetings with all managers and supervisors emphasizing CAP excellence and lessons learned from the self-assessments, and to align the licensee supervisory team on a set of common expectations for achieving and sustaining high performance, specifically in implementing effective corrective actions. Monthly department meetings were established, as well as a First Line Supervisors working group which met regularly to focus on standards and expectations. The team attended meetings to verify adequate implementation. Additionally, guidance was added to hold managers and supervisors accountable through performance appraisals which will be based, in part, on compliance with these expectations. Notwithstanding all actions taken, the team noted only one corrective action was credited as a corrective action to prevent recurrence of this particular common cause, to implement an accountability matrix, of an issue that has been repeatedly identified as a plant issue in several self-assessments and outside assessments. The inspectors reviewed the accountability matrix and found it more appropriate as a tool for managers to fix accountability as a result of an event or incident, and determined that there was no method to measure the effectiveness of the CATPR. The additional corrective actions credited to address this cause were implemented from other PERs as described in the assessment of the effectiveness of corrective actions. The inspectors verified that each corrective action was implemented as proposed in the corrective action plan and was consistent with the common cause evaluation. The team determined the corrective actions identified to date to address this common cause were appropriate in focusing the licensee on effective management oversight, specifically in the area of implementation of appropriate corrective actions, but noted that the licensee has identified that additional actions are warranted and has chartered another root cause evaluation from which additional root causes and corrective actions may be determined.

Common Cause 3 stated that “Corrective Action Program training in the areas of CAP key concepts, program requirements and program tools is less than adequate. This includes Apparent Cause Analysis, Root Cause Analysis and duties and responsibilities of CARB members, PSC members, and supervisors. The tools include monitoring tools.” The team verified six corrective actions to prevent recurrence have been implemented, or are scheduled to be implemented, as well as additional actions to train managers, supervisors, and station personnel in the use of CAP tools. These corrective actions include the completion of a training needs analysis to determine necessary training for managers and supervisors to improve understanding of CAP key concepts, program requirements, and program tools. Additionally, CARB members, PSC members, and CAP coordinators attended 2-day dedicated training in May and June 2008 on elements of an effective corrective action program. The licensee also

developed Job Familiarization Guides for CAP preparers, department coordinators, managers and supervisors, as well as qualification cards for Apparent Cause Evaluators, Root Cause Evaluators, and PSC and CARB members. Finally, the licensee conducted Apparent Cause Evaluator refresher training, required to be taken by all apparent cause evaluators prior to performing any apparent cause evaluations. The team noted additional corrective actions to prevent recurrence have yet to be implemented. They included implementation of the Job Familiarization Guides and qualification cards that were developed, and development and implementation of training materials for CAP preparers, department coordinators, managers, supervisors, Apparent and Root Cause Evaluators, PSC and CARB members. Finally, the licensee has a corrective action to conduct a self-assessment to determine the effectiveness of the CAP training. The team reviewed the licensee's plans for implementation of these CATPRs and found the corrective actions and implementation schedule to be appropriate to address the common cause.

In addition to the corrective actions to address the common causes, the team noted the implementation of a PER CRB to review closeout of corrective actions for Category A and B PERs, as well as a sample of Category C PERs, to ensure that actual corrective actions completed for PERs were consistent with the corrective action plans and appropriate to address the concerns raised in the PERs. The team attended this meeting and determined the reviews conducted by the CRB were thorough and critical in addressing inadequacies in closeout of PER corrective actions. The team also noted that the CRB is only temporarily chartered by the CARB, and not a permanent part of the CAP.

The backlog of open PERs has shown improvement over the past several months; however, a substantial backlog of open issues still exists. The reduction in the backlog has allowed the licensee to focus efforts on implementing timely and appropriate corrective actions. The team also noted improvement in CAP performance indicators, such as average age of A and B level PERs and average age of CATPRs. Therefore, the team determined some progress was being made in addressing CAP deficiencies.

Based upon the brief period of time between the implementation of these corrective actions and this inspection, the team was unable to determine their effectiveness. The licensee has initiated a corrective action to evaluate the effectiveness of all corrective actions to address the substantive cross-cutting issue by June 2009.

(3) Findings

No findings of significance were identified.

f Corrective Action Program and Vibration-Induced Failures of Residual Heat Removal (RHR) Heat Exchanger (Hx) Service Water (SW) Outlet Flow Control Valves (FCVs)

(1) Inspection Scope

Between March 24 and March 30, 2008, during the Unit 3 refueling outage, the licensee disassembled the Division I 3A and 3C and Division II 3B and 3D RHR Hx SW outlet FCVs and found significant degradation in each valve, including stem-to-disc separation in three of the four valves. Results from a special inspection concerning degradation of these RHR Hx SW outlet FCVs was documented in the May 30, 2008, NRC Special

Inspection Report 05000259/2008009, 05000260/2008009, and 05000296/2008009. The special inspection was based, in part, upon a preliminary licensee evaluation and technical information available at the time. This inspection focused on implementation of the licensee's CAP as it related to the RHR Hx SW outlet FCV degradation.

Specifically, the team reviewed the licensee's root cause analysis (RCA) and corrective actions associated with PER 141380, "U3C13 RHRSW Outlet Valve Damage." This PER was initiated to determine the extent of condition, applicability to Units 1 and 2, and whether the root cause in PER 104621, Terminal Lug Failures, bounded the conditions in PER 141380. Licensee analyses yielded three root causes and two contributing causes. The team also reviewed: the licensee's Technical Specifications and bases; the safety analysis report; design criteria and changes; program and system operating procedures; system drawings; WOs; functional evaluations associated with valve damage; PERs associated with licensee corrective actions, including those resulting from this NRC inspection; and industry operating experience. Furthermore, the team interviewed responsible system and design engineers, engineering management, and the operations procedures supervisor.

(2) Assessment

The team determined that the licensee's PER 141380 RCA was adequate and had been completed in accordance with their recently revised corrective action program procedures and expectations. The team verified that the RCA adequately:

- identified vibration-induced valve damage as the problem;
- focused the extent of condition to throttling valves operating below 30 percent of valve position;
- discussed previous similar internal and external events;
- arrived at root and contributing causes with multiple structured methods; and
- implemented interim and long term corrective actions appropriately.

The team agreed with the licensee's conclusions that root and contributing causes of the damage to valves in Unit 3 were also applicable to similar valves in Units 1 and 2. Furthermore, the team agreed that the root cause evaluation completed for PER 104621, Terminal Lug Failures, did not bound the total population of vibration-induced damage, and was itself bounded by the root cause for PER 141380.

In PER 141380, the licensee used a combination of hazard-barrier analysis, events-and-causal-factor charting, Kepner-Tregoe analysis, and management-oversight-and-risk-tree analyses to identify the three root causes and two contributing causes. The team's review of the results as presented in the RCA determined that the conclusions in the RCA appeared to be reasonable. However, the team identified that a statement in the RCA extent of condition section of the Kepner-Tregoe analysis incorrectly stated "U2 Walworth valves did not experience stem/disk failures". The Unit 2 RHR Hx SW outlet FCV, 2-FCV-23-40, had experience a stem/disk failure in 2003, and that fact was noted in another section of the RCA. The licensee initiated PER 155360 for this error. The team determined that this error did not impact the overall conclusion of the RCA.

The team also reviewed corrective actions implemented as a result of the RCA, specifically focusing on corrective actions to prevent recurrence. The team verified timely completion of actions already completed and appropriate scheduling of those actions not yet completed (such as Units 2 and 3 valve design, installation and testing). Additionally, the team reviewed the adequacy of completed corrective actions, specifically with respect to operating procedures, but also with respect to other technical procedure changes and training. The team's observations involving Units 1, 2, and 3 operating instructions (OI)-74 for RHR, subsequently documented in PER 155282, included:

- The permissive pressure setpoint associated with opening the shutdown cooling suction cooling valves would not allow the operators to open the valves at the highest value specified in OI-74. OI-74 instructs operators to open the valves at 105 psig or less.
- Two OI-74 caution notes are ambiguous as to what is meant by a preferred Hx. The procedure writer supervisor agreed that the instructions were not sufficiently clear to preclude an incorrect interpretation. The intent was to specify that the 2C or 2D Hxs be used if possible in lieu of the Unit 1 and 3 Hxs since they result in less vibration issues with their RHR Hx SW outlet valves.

The team also reviewed licensee work orders to verify corrective actions implemented by the RCA. The team noted that WO 08-718551 was to "perform inspection of valve 1-FCV-23-40 internals and immediate piping downstream to look for vibration and cavitation damage". The team noted that the instructions in the subject WO were more generic than specific. For example, the WO did not include instructions to inspect the Copes Vulcan valves for damage states that had been experienced by Anchor Darling and Walworth valves such as failures of valve actuator terminal leads/lugs, anti-rotation collars, and disc/stem connections. Furthermore, the team noted that the design of the Copes Vulcan stem-to-disc connection is different from the designs used in the Anchor Darling or Walworth valves, and therefore could experience failures that may be different from the failures experienced by the Anchor Darling or Walworth valves. In response to the team's observations, the licensee initiated PER 155436 to revise the WO. The WO, when implemented, determined that the valve was in good condition with all components operating in accordance with design.

(3) Findings

Introduction: The NRC identified a Green NCV of 10 CFR 50, Appendix B, Criterion II, "Quality Assurance Program," for the licensee's failure, between April 2000 and January 2008, to carry out their Nuclear Quality Assurance Plan policy in that trend analysis performed on adverse conditions did not result in trend results which identified vibration-induced, failed or degraded RHR Hx SW outlet FCVs as an adverse trend that needed increased management attention. Between April 2000 and January 2008, there were 17 instances of failed or degraded Unit 2 and 3 RHR Hx SW outlet FCVs due to vibration-induced damage entered into the licensee's CAP. This issue has been identified in the licensee's CAP as PER 159606.

The NCV issued in NRC Special Inspection Report 05000259/2008009, 05000260/2008009, and 05000296/2008009, which was based upon incomplete information, is being withdrawn. Further inspection of the licensee's corrective action program determined that, under the licensee's CAP program, each RHR Hx SW outlet FCV failures and degraded equipment problems were not significant conditions adverse to quality. Thus, the licensee was not required to establish corrective actions to prevent recurrence in accordance with 10 CFR 50 Appendix B, Criterion XVI as stated in the Special Inspection Report NCV. The NCV in this report is the appropriate disposition of the subject RHR Hx SW outlet FCVs failures and degraded equipment problems.

Description: Between March 24 and March 30, 2008 (Unit 3 cycle 13 refueling outage), the licensee disassembled both Unit 3 Division I 3A and 3C, and Division II 3B and 3D RHR HX SW Outlet FCVs and found significant degradation in each valve including stem-to-disc separation in three of the four FCVs. The team reviewed licensee records and determined that 22 failed or degraded Unit 2 and 3 RHR Hx SW outlet FCVs had been entered into the licensee's CAP since April 2000. The dates, affected FCV and the as-found conditions are listed below:

<u>Month/Year</u>	<u>Valve</u>	<u>Condition</u>
March 2008	3-FCV-23-34	separated disc from stem
March 2008	3-FCV-23-40	separated disc from stem
March 2008	3-FCV-23-46	separated disc from stem
March 2008	3-FCV-23-52	broken stem-to-disc tack welds
March 2008	3-FCV-23-52	separated stem cap
January 2008	3-FCV-23-40	broken motor lug
July 2007	3-FCV-23-34	broken motor leads
March 2007	2-FCV-23-52	sheared stem
November 2006	2-FCV-23-52	separated hand wheel
April 2006	2-FCV-23-52	separated stem cap
March 2006	3-FCV-23-34	broken motor leads
April 2005	3-FCV-23-34	broken motor leads
July 2004	3-FCV-23-34	slipped anti-rotation collar
July 2004	3-FCV-23-40	slipped anti-rotation collar
April 2004	3-FCV-23-46	slipped anti-rotation collar
November 2003	2-FCV-23-46	broken motor lead
October 2003	2-FCV-23-40	separated disc from stem
April 2003	3-FCV-23-46	slipped anti-rotation collar
August 2002	3-FCV-23-34	separated hand wheel
March 2002	2-FCV-23-52	separated hand wheel
November 2001	2-FCV-23-52	separated hand wheel
April 2000	3-FCV-23-46	separated disc from stem

The team determined that each of above failed or degraded RHR Hx SW outlet FCVs were repaired appropriately.

In addition to the above problems, during inspections of valve internals, the licensee had noted significant erosion of valve rib guides and valve bowls in several RHR Hx SW outlet FCVs. Also during shutdown-cooling operation, the licensee had noted cavitation noise and RHR Hx SW outlet FCV vibration. In PER 141380, the licensee had identified that high vibrations during shutdown cooling were documented as a concern as far back

as 1972. The team determined that vibration was a factor in all of the observed RHR SW Hx outlet FCV damage. Vibration and flexure of the stem during high differential pressure (low flow conditions) caused the tack welds between the disc and stem to break and the disc to separate from the stem. Vibration also caused fatigue failure of the motor leads and lugs. Furthermore, vibration caused the set screws on the anti-rotation devices and the hand wheels to loosen allowing the anti-rotation devices to slip and the hand wheels to separate from the RHR Hx SW outlet FCVs.

The team reviewed the licensee's corrective actions, taken or planned to date, to address the vibration-induced damage. These actions included making stem-to-disc tack welds more robust, removing valve motor terminal blocks, installing Raychem on valve motor leads and lugs, dimpling the stem to set the anti-rotation collars, and installing double set screws in the hand wheels. Excluding the sheared stem, the team concluded that these actions appropriately addressed the observed symptom or damage.

The team reviewed the licensee's operability determinations associated with the four degraded Unit 3 RHR Hx SW outlet FCVs discovered in March 2008 to have degraded conditions concurrently. Based upon recent surveillance flow test data, valve stroke data, heat exchanger leak testing (some RHR Hx SW outlet FCVs were boundary valves for leak test), operation of the keep fill system (no abnormal leakage from system) and physical inspections of these RHR Hx SW outlet FCVs, the licensee determined that these four RHR Hx SW outlet FCVs remained capable of performing both their open and close safety functions. For example, even with separated discs and stems, surveillance testing verified that adequate flow through the RHR Hx SW outlet FCVs was available due to the valve disc floating off its seat sufficiently when the valve stem was withdrawn. The team agreed with the licensee's evaluation that although these RHR Hx SW outlet FCVs were degraded, they were still capable of performing their safety function.

Since January 1, 2005, the team found that the only problems that actually rendered the RHR Hx SW outlet FCVs inoperable were the broken motor leads and lugs. However, these failures only caused one RHR Hx SW outlet FCV to be inoperable at a time. With three of the four subsystems and one train of RHR SW operable, the RHR SW system remained capable of performing its safety function. Furthermore, during this time period the licensee had routinely performed a weekly chemistry preventive maintenance activity (PM 500136712) which put flow through the RHR Hxs. As a result, the RHR Hx SW outlet FCVs were cycled opened and closed. In addition, for the sheared stem condition, the licensee had determined that the RHR Hx SW outlet FCV would have opened and closed when needed based upon the alignment of the stem pieces. The performance of the preventive maintenance activity limited the time that any RHR Hx SW outlet FCV would be inoperable without being detected was less than the 30 days allowed by TS 3.7.1 for one subsystem of RHR SW being inoperable.

The root causes identified by the licensee in PER 141380 were: inadequate valve design for the full range of RHRSW flow rates; breakdown in the CAP resulting in less than adequate cause evaluations and extent of conditions, and not initiating a trend PER; and ineffective management controls underlying repetitive failures and untimely corrective actions. Contributing causes identified by the licensee were early entry into shutdown cooling resulting in high temperatures and flashing-flow conditions, and incorrect implementation of split flows (a corrective action that the licensee had identified in 2000).

In NRC Special Inspection Report 05000259/2008009, 05000260/2008009, and 05000296/2008009, the inspectors had noted that although each individual symptom was being corrected, the overall known common cause, vibration, had not been addressed by the licensee. During that inspection, the inspectors determined that the 17 failures or degraded conditions of the RHR Hx SW outlet FCVs, between April 2000 and January 2008, were due to vibration during low flow throttling operations. The team concluded that the number of failures and degraded conditions constituted an adverse trend which had not been identified by the licensee. The TVA Nuclear Quality Assurance Plan, TVA-NQA-PLN89-A, revision 18, dated November 30, 2007, section 10.2.5, "QA Trending," specifies that trend analysis be performed on adverse conditions and be used to identify trends that need increased management attention. As of the January 2008 RHR Hx SW outlet FCV failure, the licensee had not identified the vibration-induced failed and degraded RHR Hx SW outlet FCVs as a adverse trend that needed increased management attention. The previous two root causes, performed or in progress, were associated only with certain symptoms such as stem-disc separation and broken motor leads and lugs, not with the adverse trend. As noted above, the subsequent root cause evaluation for PER 141380 identified not initiating a trend PER as one of the root causes for the degraded RHR Hx SW outlet FCVs.

In the NRC Special Inspection Report, the inspectors had noted that the licensee had planned to replace the Anchor-Darling and Walworth RHR Hx SW outlet FCVs with Copes Vulcan valves due to their greater mass which would dampen the vibration. However, In the RCA for PER 141380, the licensee determined that the Copes Vulcan valves were not designed to be used in the low-flow conditions experienced during shutdown cooling. As a result the licensee initiated modification activities to install a smaller bypass valve in parallel with the larger Copes Vulcan valves. This will assist the Copes Vulcan valves in low flow conditions.

Analysis: Failure to identify an adverse trend of vibration-induced failed or degraded RHR Hx SW outlet FCVs was a performance deficiency. This resulted in a lack of management attention to require a common cause evaluation to address continuing vibration-induced damage to the RHR Hx SW outlet FCVs. This finding was more than minor because it affected the Mitigating System cornerstone objective of ensuring the reliability of systems that respond to initiating events to prevent undesirable consequences and the cornerstone's attribute of equipment performance. Using the Phase 1 screening criteria of the Significance Determination Process, the finding was determined to be of very low safety significance because to the RHR Hx SW outlet FCV failures did not represent an actual loss of a safety function of a single RHR SW train for greater than its Technical Specification allowed outage time of 30 days.

The team determined that the cause of this finding was related to the Trend Performance in the CAP aspect of the corrective action component in the Problem Identification and Resolution cross-cutting area, in that, the licensee failed to properly assess information in their CAP to identify the common cause problem of vibration-induced failed and degraded RHR Hx SW outlet FCVs.(P.1(b)).

Enforcement: 10 CFR 50, Appendix B, Criterion II requires, in part, that the licensee shall establish a quality assurance program and the program shall be documented by written policies, procedures and instructions and be carried out in accordance with those policies, procedures and instructions. Nuclear Quality Assurance Plan, TVA-NQA-PLN89-A, revision 18, dated November 30, 2007, section 10.2.5, "QA Trending,"

specifies that "Trend analysis shall be performed on adverse conditions and quality indicators associated with QA verification activities. Trend results shall be used to advise management of the quality status, identify adverse trends that need increased management attention, and compare quality of performance among organizations." Contrary to the above, between April 2000 and January 2008, quality assurance policies and procedures were not carried out, in that, trend analysis performed on adverse conditions did not result in trend results which identified vibration-induced, failed or degraded RHR Hx SW outlet FCVs as an adverse trend that needed increased management attention. Because this finding was of very low safety significance and has been entered into the licensee's corrective action program as PER 159606 consistent with Section VI.A of the NRC Enforcement Policy, this violation is being treated as an NCV 05000260, 296/2008007-01, "Failure to Identify an Adverse Trend for Vibration-induced, Failed or Degraded Unit 2 and 3 RHR Hx SW Outlet FCVs."

40A6 Exit Meeting

On October 24 and December 17, 2008, the inspectors presented the inspection results to Mr. R. West and Mr. S. Bono, respectively, and other members of the Browns Ferry staff who acknowledged the results. The inspectors confirmed that proprietary information was not provided or retained following the inspection.

40A7 Licensee-Identified Violations

The following Green violation of very low safety significance was identified by the licensee and is a violation of NRC requirements which met the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600, for disposition as a NCV.

10 CFR 50, Appendix B, Criterion II requires, in part, that the licensee shall establish a quality assurance program and the program shall be documented by written policies, procedures and instructions and be carried out in accordance with those policies, procedures and instructions. Nuclear Quality Assurance Plan, TVA-NQA-PLN89-A, revision 18, dated November 30, 2007, section 10.2.5, "QA Trending," specifies that trend analysis shall be performed on adverse conditions and quality indicators associated with QA verification activities and trend results shall be used to identify adverse trends that need increased management attention. Contrary to this, quality assurance policies and procedures were not carried out, in that, during a special review, the licensee documented in PER 152810 an adverse trend associated problems with General Electric type AK-2A-15 and AK-2A-25 circuit breakers trip units. Although 15 PERs had been issued in 15 months for trip unit problems, the licensee's normal trending program had failed to detect this adverse trend. This issue was of very low safety significance, in that, licensee's evaluations determined that due to various mitigating circumstances, i.e., a redundant breaker maintained the safety function, that the safety function was not lost.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

S. Berry, Systems Engineering Manager
S. Bono, Engineering Manager
J. Davenport, Licensing Engineer
S. Douglas, General Manager of Site Operations
D. Feldman, Interim Operations Manager
R. Godwin, Site Support Manager
K. Harvey, RHRSW System Engineer
E. Johnson, System Engineer – EDG
J. Kennedy, Concerns Resolution Program Coordinator
J. Kulisek, Operations Procedures Supervisor
F. Loscalzo, Design Engineer
R. Marsh, Operations Shift Manager
D. Matherly, Turnaround Plan – Performance Improvement Manager
J. Miskell, NSSS Supervisor
J. Mitchell, Site Security Manager
J. Moore, System Engineer – MS
E. Quinn, Performance Improvement Manager
K. Skinner, System Engineer – CRD
R. Stowe, Nuclear Operations Support Superintendent
J. Walton, Radiation Protection Supervisor
R. West, Site Vice President
J. Whisenant, System Engineer – 480 V Breakers
A. Yarbrough, Raw Cooling Water Systems Lead Engineer

NRC

E. Guthrie, Branch Chief, Reactor Projects Branch 6
S. Vias, Branch Chief, Reactor Projects Branch 7
T. Ross, Senior Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000260, 296/2008007-01	NCV	Failure to Identify an Adverse Trend for Vibration-induced, Failed or Degraded Unit 2 and 3 RHR Hx SW Outlet FCVs (Section 4OA2.f)
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Discussed

None

Attachment

LIST OF DOCUMENTS REVIEWED

Procedures

BP-250, "Corrective Action Program Handbook," Rev. 12
BP-213, "Managing TVA's Interface with NRC," Rev. 25
OPDP-1, "Conduct of Operations", Revision 11
PIDP-1, "PER Initiation," Rev. 0
PIDP-3, "Operability and Reportability Reviews of PERs," Rev. 0
PIDP-4, "Corrective Action Program Screening and Oversight," Rev. 1
PIDP-6, "Root Cause Analysis," Revision 1
PIDP-7, "PER Actions," Rev. 1
PIDP-8, "PER Operating Experience and Generic Reviews," Rev. 0
PIDP-9, "PER Closure," Rev. 0
PIDP-10, "PER Effectiveness Reviews," Rev. 0
PIDP-11, "PER Trending," Rev. 0
PIDP-14, CAP Health Monitor," Rev. 0
SPP-1.0, "Organization and Administration," Rev. 3
SPP-1.6, "NPG Self-Assessment and Benchmarking Program," Rev. 16
SPP-3.1, "Corrective Action Program," Rev. 13
SPP-3.1, "Corrective Action Program," Rev. 15
SPP-3.9, "Operating Experience Program," Rev. 0
SPP-6.1, "Work Order Process Initiation," Rev. 5
SPP-7.1, "On Line Work Management," Rev. 10
EPI-0-000-BKR020, "Testing and Troubleshooting of 250 VDC and 480 VAC Power Circuit Breakers and Trip Devices," Rev. 36
EPI-0-000-FRZ002, "Freeze Protection Program for Condensate Tank," Rev. 14
0-TI-346, "Maint. Rule Performance Indicator Monitoring, Trending, and Reporting," Rev. 34
0-OI-67, "Emergency Equipment Cooling Water," Rev. 84
0-OI-23, "Residual Heat Removal Service Water System," Revisions 84 and 87
0-TI-552, "Guidelines for the Completion of Valve and Valve Operator Data Sheets," Revision 0
1,2,3-OI-74, "Residual Heat Removal System, Revisions," 137 and 138
2-GOI-100-12A, "Unit Shutdown from Power Operation to Cold Shutdown and Reductions in Power During Power Operations," Revision 88

Problem Evaluation Reports

PER 98-0138	PER 98-7420	PER 98-10453	PER 37328
PER 42117	PER 50084	PER 55557	PER 56793
PER 59786	PER 61823	PER 64906	PER 64926
PER 67571	PER 81376	PER 101585	PER 102298
PER 104621	PER 104632	PER 112190	PER 114061
PER 114298	PER 116511	PER 118401	PER 119773
PER 120941	PER 121265	PER 121876	PER 124666
PER 124749	PER 124944	PER 125988	PER 126049
PER 126211	PER 127653	PER 128449	PER 128870
PER 129517	PER 129744	PER 129747	PER 129927
PER 129940	PER 126054	PER 130127	PER 130567
PER 130644	PER 130735	PER 130777	PER 131413
PER 131548	PER 131723	PER 131878	PER 132061

PER 132186	PER 132427	PER 132447	PER 132643
PER 132644	PER 132645	PER 132646	PER 132649
PER 132769	PER 132968	PER 132743	PER 133600
PER 133629	PER 133647	PER 133693	PER 133866
PER 133899	PER 134030	PER 134209	PER 134244
PER 134284	PER 134346	PER 134407	PER 134465
PER 134715	PER 134979	PER 135075	PER 135250
PER 135286	PER 135876	PER 135878	PER 136489
PER 136662	PER 136773	PER 136915	PER 137010
PER 137236	PER 137641	PER 137771	PER 137947
PER 138371	PER 138724	PER 138856	PER 138913
PER 139315	PER 139377	PER 139402	PER 139516
PER 139863	PER 140165	PER 140425	PER 140683
PER 140874	PER 141071	PER 141088	PER 141091
PER 141321	PER 141380	PER 141502	PER 141579
PER 141631	PER 142243	PER 142285	PER 142338
PER 142541	PER 143128	PER 143272	PER 143448
PER 143502	PER 144272	PER 144785	PER 144932
PER 145281	PER 145687	PER 146147	PER 146171
PER 146189	PER 146260	PER 146521	PER 146522
PER 147015	PER 147128	PER 147133	PER 147141
PER 147231	PER 147283	PER 147293	PER 147295
PER 147571	PER 147573	PER 147684	PER 147686
PER 147726	PER 147758	PER 147763	PER 148171
PER 148183	PER 148390	PER 148690	PER 148691
PER 148692	PER 148699	PER 148700	PER 148701
PER 148702	PER 148785	PER 149308	PER 149850
PER 149942	PER 150065	PER 150471	PER 151424
PER 151680	PER 151681	PER 151682	PER 151683
PER 151686	PER 152810	PER 153202	PER 153453
PER 153475	PER 153478		

Work Orders

02-101722-000	03-008662-000	03-019285-000	06-724068-000
07-710228-000	07-710228-001	07-710229-000	07-710352-000
07-717486-000	07-717733-000	07-717876-001	07-720202-000
07-720996-000	07-721688-000	07-722316-000	07-722378-000
07-723359-000	07-723359-001	07-723747-000	07-724250-000
07-724251-000	07-724252-000	07-724253-000	07-724254-000
07-724255-000	07-724256-000	07-724257-000	07-724312-000
07-726501-000	07-726595-000	08-710478-000	08-712378-000
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08-718551-000	08-722525-000		

Operator Workarounds

0-077-OWA-2006-0113
 0-077-OWA-2006-0114
 0-077-OWA-2007-0016
 1-073-OWA-2007-0074
 2-085-OWA-2008-0079

Self-Assessments

BFN-CEM-08-001, Self-Assessment Report, Secondary Chemistry
 BFN-ENG-07-003, Self-Assessment Report, Containment Leak Rate Test Program
 BFN-M&M-08-001, Performance Evaluation Program, MMDP-1
 BFN-M&M-08-002, Foreign Material Control Program
 BFN-M&M-08-004, Self-Assessment Report, Effectiveness Review: SOER 06-1, Rigging, Lifting and Material Handling
 CRP-PA-08-002, Operating Experience Program, 5/19/08
 CRP-PA-08-004, NPG Focused Self-Assessment Report, BFN Problem Identification and Resolution
 NA-BF-06-011, Nuclear Assurance – Assessment of Browns Ferry Corrective Action Program Extension Process
 SSA 0703, Browns Ferry, Sequoyah, Watts Bar Nuclear Plants and Corporate – Quality Control Programs Audit Module 2 (Procurement, Corrective Action Program, and Plant Review Committees)
 SSA 0801, Fitness for Duty (FFD)
 SSA 0804, Nuclear Power Group (NPG) Wide – Radiological Emergency Preparedness Program Audit Report

Drawings

0-17W510-01, Condensate, Demineralized Water, and Misc Tunnel Piping
 0-15N730-9, 480V Water and Oil Storage BD Connection Diagram
 3-47E858-1, Flow Diagram RHR Service Water System, Revision 27
 Copes Vulcan Drawing D-376495, 16 Inch Class 300, Revision 7

Other Documents

Browns Ferry Unit 1, Unit 2, and Unit 3 System Status – 2nd Period FY 2007
 Browns Ferry Unit 1, Unit 2, and Unit 3 System Status – 3rd Period FY 2007
 Browns Ferry Unit 1, Unit 2, and Unit 3 System Status – 1st Period FY 2008
 Browns Ferry Unit 1, Unit 2, and Unit 3 System Status – 2nd Period FY 2008
 GE SIL 173, Supplement 1, Revision 1
 Engineering Evaluation 07-3-ISWT-085-335
 BFN-VTD-G080-1080, Installation and Maintenance Instruction for EC Trip Devices, Rev. 0
 BFN-50-7002, Design Criteria Document Condensate and Demineralized Water System, Rev. 9
 Project 4B49, Low Voltage (480 VAC and 250 VDC) Nonsafety Related Breakers, Rev.0
 Project 2A48, U2 and Common Nonsafety Related Breakers - Trip Device Replacement, Rev. 3
 Project 3916, 480V Breaker Replacement, Rev. 0
 Project 4A48, Low Voltage (480 VAC and 250 VDC) Safety Related Breakers, Rev. 0
 EPRI guidance “Circuit Breaker Maintenance Volume 1: Low-voltage Circuit Breakers Part 2: GE AK Models,” Rev. July 1992
 Functional Evaluation 42538 for PER 141380, U2 Heat Exchanger Outlet Valves 2-FCV-23-34,

40, -46 & -52, dated April 11, 2008
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 FSAR Section 4.8, Residual Heat Removal System, BFN-22
 10 CFR Part 21, SC04-10, SRM/IRM Preamps, 8/12/04
 General Design Criteria Document BFN-50-7023, Residual Heat Removal Service Water System
 Design Change Notice 69340, Unit 2 RHRSW Discharge Valves Replacement, Revision A Browns Ferry Operational Focus List
 NRC Information Notice No. 83-55: Misapplication of Valves by Throttling Beyond Design Range
 NRC Special Inspection Report 05000259/2008009, 05000260/2008009, and 05000296/2008009, May 30, 2008
 NRC Letter, Response to Your Letter Dated June 30, 2008, Concerning NRC Special Inspection Report for RHRSW (Residual Heat Removal Service Water) Valve Damage at Browns Ferry Technical Specifications and Bases 3.7.1 RHRSW System and Ultimate Heat Sink, Amendment 254
 TVA Root Cause Analysis U3C13 RHRSW Outlet Valve Damage, PER 141380

PERs Generated as a Result of this Inspection

PER 153385, Inadequate PER corrective action closure
 PER 153792, PSC member documentation
 PER 153836, NRC comments on PER 141502 regarding closing out PER to future actions
 PER 153878, EDG Common Cause Analysis
 PER 153900, Corrective Action not fully implemented
 PER 154970, Department Review of Nuclear Network Download
 PER 155137, 3C DG air intake oil bath filter – loose paint chips
 PER 155144, DG engine exhaust expansion joint – corroded bolting
 PER 155151, 3C DG air start motor tubing interference
 PER 155155, 3C DG air start motor exhaust piping is loose
 PER 155157, Operator workaround not initiated in a timely manner
 PER 155158, B DG – excessive oil leak from engine oil exhaust piping
 PER 155167, 3C DG heat exchanger pressure rerate tags
 PER 155261, Condensate missing heaters in the tunnel
 PER 155297, Incorrect PER classification and closure
 PER 155321, Root cause analysis for PER 140874 did not document operating experience