



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
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ATLANTA, GEORGIA 30303-8931**

December 19, 2003

Tennessee Valley Authority
ATTN: Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

**SUBJECT: BROWNS FERRY NUCLEAR PLANT - NRC PROBLEM IDENTIFICATION AND
RESOLUTION INSPECTION REPORT 05000259/2003008, 05000260/2003008
AND 05000296/2003008**

Dear Mr. Scalice:

On November 21, 2003, the Nuclear Regulatory Commission (NRC) completed an inspection at your Browns Ferry 1, 2 and 3 reactor facilities. The enclosed inspection report documents the inspection results, which were discussed on November 21, 2003, with Mr. Ashok Bhatnagar and other members of your staff.

The inspection was an examination of activities conducted under your license 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 license. Within these areas, the inspection involved selected examination of procedures and representative records, observations of activities, and interviews with personnel. This inspection was a routine biennial inspection of your Corrective Action Program for Units 2 and 3 in the NRC's Baseline Inspection Program. However, it also evaluated the adequacy of your Corrective Action Program on Unit 1, currently undergoing recovery efforts to return to operation, for future inclusion into our Reactor Oversight Process and routine Baseline Inspection Program.

On the basis of the sample selected for review, there were no findings of significance identified during this inspection. The inspectors concluded that problems were properly identified, evaluated and resolved within the problem identification and resolution programs. In addition, the inspection confirmed that you have established an adequate corrective action process to support the current activities associated with Unit 1 recovery.

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Sincerely,

/RA/

Stephen J. Cahill
Reactor Projects Branch 6
Division of Reactor Projects

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

Enclosure: NRC Inspection Report 05000259/2003008, 05000260/2003008,
05000296/2003008
w/Attachment: Supplemental Information

cc w/encl: (See page 3)

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos: 50-259, 50-260, 50-296

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

Report No: 05000259/2003008, 05000260/2003008 and
05000296/2003008

Licensee: Tennessee Valley Authority (TVA)

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

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

Dates: November 3 - 7, and November 17 -21, 2003

Inspectors: S. Shaeffer, Senior Project Engineer (Team Leader)
K. VanDoorn, Senior Reactor Inspector
W. Bearden, Senior Resident Inspector, Unit 1 (first week)
E. Christnot, Resident Inspector (second week)

Approved by: Stephen J. Cahill, Chief
Reactor Project Branch 6
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000259/2003-008, 05000260/2003-008, 05000296/2003-008; 11/3-7, 17-21/2003; Browns Ferry Nuclear Plant, Units 1, 2 and 3; Biennial baseline inspection of the problem identification and resolution program. Included focused review of Unit 1 Corrective Action Program implementation to support ongoing Unit 1 recovery.

The inspection was conducted by a Senior Project Engineer, a Senior Reactor Engineer, a Senior Resident Inspector, and a Resident Inspector. No findings of significance were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. Inspector-Identified and Self-Revealing Findings

Identification and Resolution of Problems

No findings of significance were identified by the team. Overall, the licensee maintained an effective program for the identification and correction of conditions adverse to quality. The licensee was effective at identifying problems at a low threshold and entering them into the Corrective Action Program (CAP). In general, the licensee consistently prioritized issues in accordance with their CAP and routinely performed adequate evaluations that were technically accurate and of sufficient depth. However, minor problems were identified related to thoroughness of corrective action program issue documentation and categorization of level D PERs for issues where higher categorization may have been more consistent with the licensee's CAP requirements. The team considered the licensee's CAP tracking program output reports to be paper intensive and a contributor to inefficiencies identified in the area of issue documentation and ability to perform efficient CAP trending.

Formal root cause evaluations for significant conditions adverse to quality were thorough and detailed. Corrective actions developed for lower level root and contributing causes were generally timely, effective, and commensurate with the safety-significance of the issue. Although the licensee incorporated a wide variety of root cause techniques, non-uniform root cause report outputs resulted in a cumbersome process for personnel to ensure all contributing causes were being adequately considered for broader corrective actions or extent of condition reviews.

The licensee's periodic self-assessments and audits were effective in identifying deficiencies in the CAP and covered all areas of plant performance. Corrective actions for previous performance examples were being actively monitored within self-assessments and audits of the CAP. Several identified repetitive deficiencies with the CAP that resulted in the issuance of higher level CAP problem reports to address. Overall, the ability to perform self critical assessments was considered an effective program attribute, especially when addressing repetitive human factor performance issues where desired improvements were continuous in nature.

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Site management was purposely active and involved in the CAP and focused appropriate attention on significant plant issues. At the Management Review Committee (MRC) meetings, management made frequent modification of Problem Evaluation Report (PER) priorities, PER descriptions, PER root cause determination techniques, and other items to ensure CAP expectations were being implemented.

Based on review of the licensee's Concern Resolution Program and discussions conducted with plant employees from various departments, the inspectors did not identify any reluctance to report safety concerns.

Initial reviews of the CAP for Unit 1 concluded that the licensee had established adequate processes and measures for including Unit 1 into the CAP at Browns Ferry. Problem identification thresholds were sufficiently low and management was actively involved in implementation of the program in order to instill consistent expectations and improve program efficiencies. Trending of Unit 1 PERs was well established and recent data did not indicate any areas of concern with the current Unit 1 recovery activities.

B. Licensee-Identified Findings

None.

REPORT DETAILS

4. OTHER ACTIVITIES (OA)

4OA2 Problem Identification and Resolution

a. Effectiveness of Problem Identification

(1) Inspection Scope

The inspectors reviewed licensee Procedure SPP 3.1, Corrective Action Program, Revision 4, which describes the administrative process for the identification and resolution of problems.

The inspectors reviewed PERs that had been initiated by the licensee since July 2001 (prior to the last NRC baseline problem identification and resolution inspection conducted in December 2001) to verify that problems were being properly identified, appropriately characterized, and entered into the corrective action program (CAP). Though not limited to, the reviews focused on issues associated with the following risk significant plant safety systems: emergency diesel generator (EDG), Residual Heat Removal Service Water (RHRSW), High Pressure Coolant Injection (HPCI) and the Control Air. In addition to the system reviews, the inspectors selected a representative number of PERs that were identified and assigned to the major plant departments which included operations, maintenance, engineering, security, chemistry, health physics, and emergency preparedness.

The inspectors also reviewed completed maintenance work orders (WOs), system health reports, and the Maintenance Rule database for the selected systems to verify that equipment deficiencies were being appropriately entered into the corrective action and Maintenance Rule programs. The inspectors conducted plant walkdowns of equipment associated with the EDG, RHRSW, HPCI, and Control Air to assess the material condition and to look for any deficiencies that had not been entered into the CAP. The inspectors reviewed historical control room operator logs to verify that equipment deficiencies, especially those involving the safety systems selected for the focused review, were entered in the CAP.

The inspectors reviewed selected industry operating experience items, including NRC generic communications, to verify that they were appropriately evaluated for applicability and whether issues identified through these reviews were entered into the CAP.

The inspectors reviewed licensee audits and self-assessments (focusing primarily on problem identification and resolution) to verify that findings were entered into the CAP and to verify that these findings were consistent with the NRC's assessment of the licensee's CAP.

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The inspectors attended plan of the day status and Management Review Committee (MRC) meetings to observe management oversight functions in the corrective action process. The inspectors also interviewed personnel from operations, maintenance, engineering, security, health physics, chemistry, and other site organizations to evaluate their threshold for identifying issues and entering them into the CAP.

Documents reviewed to support the inspection are listed in the Attachment.

(2) Assessment

The inspectors determined that the licensee was effective in identifying problems and entering them into the CAP. PERs normally provided complete and accurate characterization of the subject issues. In general, the threshold for initiating PERs was very low and employees were encouraged by management to initiate PERs. This was currently evidenced by the approximate 4,500 Unit 2 and Unit 3 PERs in 2003 year to date and approximately the same amount exclusively for Unit 1. Equipment performance issues involving maintenance effectiveness, such as maintenance errors, poor maintenance work practices, and inadequate risk assessments, were being identified at an appropriate level and entered into the CAP. Although several NRC identified PERs were initiated during the inspection for identified material condition issues, plant tours confirmed that the threshold for identifying material condition issues was low.

The licensee was effective in evaluating internal and external industry operating experience items for applicability and entering issues into the CAP. The team found that communication for internal operating experience between other TVA sites was frequently reviewed and samples indicated that applicable issues were identified at the Browns Ferry site and appropriate followup was being performed. The licensee's program for reviewing and processing operating experience for external sources was also well established. The site also contributed to operating experience databases on a frequent basis to allow other utilities to benefit from Browns Ferry operating experience.

Department self-assessments and audits performed by the Quality Assurance (QA) organization and other individual section groups covered all areas of plant performance and were effective in identifying issues and these deficiencies were entered into the CAP. QA audits were particularly self-critical and identified a number of substantive issues or directed attention to areas that needed improvement. The team considered that the audits and self-assessments reviewed were focused on identifying weaknesses and areas for improvement, rather than documenting existing program area strengths. Corrective actions for previous performance examples were being actively monitored within self-assessments and audits of the corrective action program. Several assessments indicated repetitive deficiencies identified with the CAP requiring the issuance of higher level CAP problem reports to address. Overall, the ability to perform self critical CAP assessments was considered an effective program attribute, especially when addressing human factor performance issues where desired improvements were continuous in nature.

Enclosure

Site management was purposely active and involved in the CAP and focused appropriate attention on significant plant issues. At the Management Review Committee (MRC) meetings, management made frequent modification of PER priorities, PER descriptions, PER root cause determination techniques, and other items to ensure CAP expectations were being implemented.

b. Prioritization and Evaluation of Issues

(1) Inspection Scope

The licensee's Corrective Action Program (CAP) defined in SPP-3.1, defines four classifications of PER significance: "A" level was the most significant, typically safety-related and requiring a formal root cause analysis; "B" level was considered significant, required further evaluation, and may require a formal root cause determination based upon management decision; "C" level was for routine problems warranting additional corrective evaluation and action; and "D" level was for issues that could be quickly resolved/closed and trended or routine problems which were adequately addressed by immediate actions or the work control process.

The team reviewed a sampling of PERs to determine if issues were classified and processed in accordance with the requirements of procedure SPP-3.1. The team attended the licensee's Management Review Committee (MRC) Meeting to observe the final classification assignment for emerging PERs. The team reviewed root cause analyses and apparent causes for PER items to assess the quality, adequacy, and thoroughness of the evaluations. In addition, the team assessed the corrective action items resulting from the cause determinations to determine if procedure requirements were met to correct the problem and to prevent recurrence if required. The cause codes identified in the PERs were compared to the identified apparent cause or root cause analyses determination to determine if the causes were correct and that the causes were adequately addressed by the corrective action item. Selected audits and self-assessments were reviewed by the team to determine if problems were developed into PERs.

Reviews were conducted to determine if the PERs were correctly classified in accordance with procedure guidance and that corrective action items were completed as described in the corrective action plan. While the majority of PERs reviewed were classified as Category D, the sample also included a representative number of Category A, B and C PERs. The inspectors' review was also intended to verify that the licensee adequately determined the cause of the problems and adequately addressed operability, reportability, common cause, generic concerns, and extent of condition. For significant conditions adverse to quality, the review was also to verify that the licensee adequately addressed the root and contributing causes and appropriately identified corrective actions to prevent recurrence. The team also reviewed self assessment process concerning the grading of PERs for improvement purposes.

Documents reviewed are listed in the attachment.

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(2) Assessment

The inspectors determined that, overall, the licensee properly prioritized issues entered into the CAP in accordance with SPP 3.1. Generally, the licensee performed adequate evaluations that were technically accurate and of sufficient depth. Formal root cause evaluations for Category level PERs A and B were more thorough and detailed than those of lesser categories, as expected. The inspectors did not identify any risk significant issues that had not been appropriately prioritized and evaluated. However, the inspectors identified several minor problems involving PERs that lacked documentation that supported the Level D classification. Based on additional reviews into each PER subject matter, the basis for the Level D classification was more apparent; however, several PERs had generic implications which were not discussed or did not reference a higher level PER handling the generic corrective actions for the site. Examples were identified where the team determined a higher level or more rigorous evaluation would have been more appropriate and/or may have been more effective in the timely resolution of the problem. Examples of these type of issues included the following:

- In 2003, PER 03-11995 identified an RHR swapover valve failed to stroke in automatic and was coded a D level PER. The apparent cause indicated hardened grease and the grease was replaced. The inspectors reviewed the valve history, and determined that this same valve had a failure to open in manual due to hardened grease in 2001 (WO 01-003661). Based on the potential for generic implications and entry into a degraded TS condition, this PER should have been a C or a B PER, according to the licensee's categorization process. Long term corrective actions for this generic issue were being implemented, such as improved preventative maintenance instructions on looking for hardened grease symptoms and site change out to a new grease less susceptible to hardening; however, these additional actions were not documented in the PER.
- 02-005723, D level PER described a through wall leak in the RHRSW system cause by Microbiologically Induced Corrosion (MIC). The PER identified the problem and fixed the specific piping issue only without any discussion of generic applicability of extent or condition reviews which were being evaluated via other activities.
- 02-015702, D lever PER described multiple problems with Control Rod (CR) indications/movements. The PER stated that appropriate maintenance had been initiated, however, the PER failed to reference the Level B PER (02-013222) which was covering the generic aspects of rod control.

The inspection determined that the licensee's use of Root Cause and Apparent Cause analysis, in general, was of sufficient quality, depth, and focus to identify applicable root causes. The licensee utilized a variety of root cause analysis techniques to determine these causes and their contributor; however, the results of the root cause evaluations

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were difficult to compare to other issues for commonality, primarily due to the non-uniform format of root cause results. The team did not identify any specific root cause adverse trends which were not identified. However, the team did conclude that efficiencies could be gained in the area of root cause analysis to ensure all contributing causes are being appropriately addressed.

An example was identified where an evaluation was not reassessed using more current information and the initial root cause identified in a PER was not updated following completion of the final root cause determination. PER 01-12072-000 detailed an event which occurred on November 24, 2001, affecting both operating units. With thunderstorms in the vicinity, Unit 2 experienced significant plant perturbations including the average power range monitor going from a low of 91 percent, to a high of 112 percent, and then back to 100 percent. Unit 3 plant experienced a significantly reduced effect which included a small power reduction and an immediate return to full power. The Unit 2 electro-hydraulic control (EHC) system for the turbine generator had been modified and included a generator load control network. The EHC system on Unit 3 had not been modified and did not have a generator load control network. The existing PER reflected that the initial analysis of the event determined that the storms caused a line fault and grid instabilities. The subsequently performed root cause for the event determined the Unit 2 modification caused the significantly different Unit 2 plant response. Although, corrective actions for the generator load control network modifications were incorporated, the existing PER was not updated to reflect the revised root cause.

c. Effectiveness of Corrective Actions

(1) Inspection Scope

The inspectors evaluated a sample of PERs, WOs, self-assessments, licensee audits and operating experience items to verify that the licensee had identified and implemented timely and appropriate corrective actions to address problems. The inspectors verified that the corrective actions were properly documented, assigned, and tracked to ensure completion. Where possible, the inspectors independently verified that corrective actions were implemented as intended. For significant conditions adverse to quality, the review was to verify that effectiveness reviews were adequately performed as required by SPP 3.1, Corrective Action. The inspectors reviewed PERs to assess the adequacy of the corrective actions applied to the PER adverse conditions. Inspectors also reviewed WOs, audits, and self-assessments to evaluate the effectiveness of corrective actions, and to determine if the timeliness met the licensee's problem identification and resolution requirements, including corrective actions to address common cause or generic concerns. The PERs selected included the system PERs and WOs discussed in report section 4OA2.a (1), as well as a selection of human performance PERs attributed to operations, engineering, and maintenance personnel. Additional PERs were selected based on their relation to security, emergency preparedness and radiation protection. The inspectors also reviewed the corrective actions taken in response to Non-Cited Violations (NCVs)

documented in NRC inspection reports over the previous two year period to verify CAP procedure requirements were met and that actions were thorough and comprehensive. Licensee corrective actions associated with 2001, 2002, and 2003 Licensee Event Reports (LER) were also sampled to confirm the implementation of key corrective actions.

The inspectors also performed selected sampling and trend analysis of a variety of CAP program and other corrective action related licensee programs. These included, but were not limited to: Operator work arounds; Temporary Alterations, Maintenance related functional failures; System Health Reports; and illuminated control room annunciators., The inspectors also reviewed the 50 oldest PERs and WOs to verify that the basis for the delay in correcting the identified problems was valid and that extensions were approved and justified as required by the CAP procedure. A sampling of deleted PERs were reviewed to assess the basis for the deletion and if the deletion was appropriate for the issue. The review was also to verify the adequacy of corrective actions to address equipment deficiencies and Maintenance Rule functional failures of the plant systems that were selected for the focused review as discussed in Section 4OA2.a.

Documents reviewed are listed in the attachment.

(2) Assessment

Overall, corrective actions developed and implemented for problems were timely and effective, commensurate with the safety significance of the issues. Corrective actions developed and implemented for plant equipment problems were generally effective in correcting the equipment deficiencies. The inspectors found that the scope and depth of corrective actions taken by the licensee were appropriate for the severity and risk significance of the problem identified. Where repetition had occurred, the licensee's trending program and rework program had identified the failures as such and the licensee had prescribed additional corrective action to address the cause.

Reviews of CAP related areas such as System Health Reports, Operator Work Arounds, control of temporary alterations, etc. indicated that the licensee was actively utilizing these programs to enhance the corrective action process in these specific areas. Once specific corrective actions for these areas were developed, they were re-integrated within the PER system. In addition, the team considered that recent improvements to the methods used to develop the System Health Reports were resulting in improved System Health Report detail and increased challenge to system engineers to identify potential safety issues not being addressed.

d. Assessment of Safety-Conscious Work Environment

(1) Inspection Scope

During technical discussions with members of the plant staff, which included operations, maintenance, engineering, chemistry, health physics, emergency preparedness, and security personnel, the inspectors developed a general perspective of the safety-conscious work environment at the site. The discussions also helped the inspectors determine if any conditions existed that would cause employees to be reluctant to raise safety concerns. The inspectors also reviewed the licensee's employee concerns program (ECP) which provides an alternate method to the CAP for employees to raise concerns and remain anonymous. The inspectors interviewed the ECP Coordinator and reviewed a select number of ECP reports completed since July 2001 to verify that concerns were being properly reviewed and identified deficiencies were being resolved in accordance with SPP-1.0, Organization and Administration, Revision 2, Appendix D, Concerns Resolution.

(2) Assessment

The inspectors concluded that licensee management emphasized the need for all employees to identify and report problems using the appropriate methods established within the administrative programs. All of the predominant methods established by the licensee, including the CAP, the WO system, and the ECP, were readily accessible to all employees. Licensee management encouraged all employees to promptly identify nonconforming conditions. Based on discussions conducted with plant employees from various departments, the inspectors did not identify any reluctance to report safety concerns.

e. Implementation of Corrective Action Program to Support Unit 1 Recovery

(1) Inspection Scope

The inspection included reviews associated with implementation of a Corrective Action Program for the Recovery Project on Unit 1. The licensee implemented a parallel CAP for Unit 1 via the incorporation of a sub-committee forming a Unit 1 Management Review Committee. The sub-committee functions the same as the Unit 2 and 3 MRC and conducts daily meetings to evaluate, control, and monitor implementation of the Unit 1 CAP. The purpose of the review was to determine if the licensee has implemented an adequate CAP to support Unit 1 recovery. In addition, the inspection reviewed whether the licensee's CAP was adequately established to support future incorporation of Browns Ferry Unit 1 into the Revised Oversight Process (ROP). The ROP is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. The ROP program was designed for evaluation of operating reactors and is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

The team observed a variety of the Unit 1 MRC and other related meetings, discussed program monitoring and trending with CAP personnel, and reviewed existing self-assessments and an audit which included Unit 1 activities. A significant portion of the

Unit 1 PERs to date were screened by the team and those issues identified in the Attachment were reviewed in detail to determine the breadth of the Unit 1 Corrective Action Program. Analysis of the types of corrective action issues being identified was performed to evaluate whether any adverse trends existed. Unit 1 reviews similar to the Unit 2 and 3 reviews described in Sections 4OA2 a. thru 4OA2 d. were also performed. There were no Unit 1 Licensee Events Reports issued over the previous three years for review.

Documents reviewed are listed in the attachment.

(2) Assessment

Initial reviews of the corrective action program for Unit 1 concluded that the licensee had established adequate processes and measures for including Unit 1 into the corrective action program at Browns Ferry. Problem identification thresholds were notably low and management was actively involved in implementation of the program in order to instill consistent expectations and improve program efficiencies. Thresholds for PER prioritizations were reasonably well established; however, occasional management upgrading of issues at the MRC was occurring. Based on trend analysis of the PERs reviewed, the team considered that the major types of PERs being identified were consistent with the status of the Unit 1 recovery effort. No unidentified adverse trends were established.

Observations of the Unit 1 MRC verified managements active and continual involvement in establishing the Unit 1 CAP. Several examples were noted where efficiencies could be gained in the processing of PERs and other information through the MRC. Examples included improvements through the reduction of paperwork associated with the existing PER system and better organization of CAP status presentations to the MRC via standardized root cause evaluations and more streamlined status updates, such as the periodic CAP update.

Through observations of the MRC for Units 2 and 3 and the Unit 1 MRC, discussions with operations shift personnel, and interface with PER coordinators, the team concluded that the licensee had established appropriate communications between the Unit 1 organization and the operating units. Daily reviews of Unit 1 issues and work activities were occurring to identify any operational impacts needing immediate or longer term corrective actions.

For Unit 1, the inspectors confirmed that the onsite contractor's ECPs were established in a manner similar to the licensee's and that the licensee ECP coordinator was periodically monitoring any active cases for the Unit 1 restart vendor organizations. Vendor accessibility to the licensee ECP was also reviewed and considered an available option for vendor personnel reporting safety concerns.

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4OA6 Management Meetings

The inspectors presented the inspection results to Mr. Ashok Bhatnagar, and other members of licensee management at the conclusion of the inspection on November 21, 2003. The inspectors confirmed that proprietary information was not provided or examined during the inspection.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel

T. Abney, Nuclear Site Licensing & Industry Affairs Manager
A. Bhatnagar, Site Vice President
L. Clardy, Site Nuclear Assurance Manager
T. Feltman, Emergency Preparedness Supervisor
R. Golub, Component Engineering Manager
C. Ottenfeld, Radiation Protection and Chemistry Manager
R. Jones, Unit 1 Restart Manager
J. Lewis, Nuclear Plant Operations Manager
T. Niessen, Jr., Engineering & Site Support Manager
R. Rogers, Maintenance & Modifications Manager
M. Skaggs, Nuclear Plant Manager

NRC personnel

B. Holbrook, Senior Resident Inspector, Browns Ferry
S. Cahill, Branch Chief, Division of Reactor Projects, RII

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

None.

LIST OF DOCUMENTS REVIEWED

Procedures

<u>Number</u>	<u>Description/Title</u>
BP- 250	Corrective Action Program Handbook
NADP-3	Managing the Operating Experience Program
ODM-1.0	Conduct of Operations
ODM-3.7	Operator Work Arounds
SPP-1.0	Concerns Resolution
SPP-1.6,	TVAN Self Assessment Program
SPP-2.2	Administration of Site Technical Procedures
SPP- 3.1	Corrective Action Program
SPP- 6.1	Work Order Process Initiation
SPP-9.5	Temporary Alterations

Problem Evaluation Reports

Unit 1 PERs

03-000035, Potential safeguards events not recognized
 03-000327, Possible teflon seat damage during welding
 03-000414, FSAR inaccuracy for bulk fuel pool temperature
 03-000546, DCN unclear for EQ cable installation
 03-002044, Potential procurement adverse trend
 03-004496, Failure to update calculation for minimum pipe wall
 03-004504, Failure to identify an unverified calculation assumption
 03-005120, Need to consider security for Control Room penetrations
 03-005210, Weaknesses in cable installation instructions
 03-005369, Cable calculation errors
 03-005402, Burnt Aux Instrument Panel relay
 03-005501, Core Spray valve calculation documentation problems
 03-005624, Loose wire in 480 VAC relay
 03-005808, Generic Reviews not considering impact on Unit 1
 03-005898, Evaluation required for Control Room ceiling tile removal
 03-005922, RHR pump motor relay setting discrepancy
 03-005965, Cable tray DCN discrepancies
 03-006218, RHR calculation discrepancies
 03-008518, Weaknesses in the modifications process
 03-008679, Bechtel Engineering improvement initiatives
 03-009140, Review of design errors and drawing errors
 03-010587, Non-fire-retardant wood found in RCA
 03-011191, Inaccurate Technical Specification Bases for suppression pool
 03-011730, Flow accelerated corrosion found
 02-004427, Plant configuration did not match drawing
 02-004986, Plant configuration did not match drawing
 02-005536, Gouge in RHR pipe
 02-006497, RHR cable inappropriately energized

02-006693, Cut rebar during drilling
 02-008749, Drywell floor steel calculation discrepancies
 02-009146, Concrete requirements not met
 02-010608, Cable type documentation discrepancies
 02-010680, Sump pump quality designation question
 02-010903, Freeze seal problems
 02-011054, HPCI calculation inconsistencies
 02-011389, Cable damage near RWCU pump
 02-011727, Seismic boundary calculation discrepancies
 02-015228, QC hold point inappropriately downgraded
 02-015233, Bolt torque requirements not clearly specified
 02-015901, Wrong yield stress used for Core Spray calculation
 02-016583, RCIC temperature switch setting questions
 02-016585, Potential Unit 2/3 RCIC operability issue
 02-016605, RCIC calculation error
 02-016702, Corrective action plan development timeliness not met

RHRSW PERs

PERs associated with low RHRSW header pressure: 03-007496, 03-001492, 03-003002, 03-003073, 03-002763, 03-021125, 02-016773, 02-015631, 02-015147, 02-012156, 02-010547, 02-007336, 02-002247, 02-002781, 02-001539, 02-003513, 01-005918, 01-006736, 01-006747, 01-006071, 95-000962

03-000977, RHRSW supply valve separated from stem
 03-003013, RHRSW heat exchanger outlet valve would not close
 03-003073, RHRSW heat exchanger valve disc damage
 03-004398, RHRSW header charging line supply valve leak
 03-021004, Nut to valve disc tack welds cracked
 03-021014, Nut to valve disc tack welds cracked
 03-021125, Nut to valve disc tack welds cracked
 03-021550, Valve required eight men to close
 02-005723, RHRSW pipe leak
 02-001042, RHR heat exchanger flush and fill valve found closed
 02-016903, RHRSW C3 pump shaft leakage excessive

CA system PERs

01-001109, Improper design of Control Air filters
 01-006033, 2A Drywell Air Compressor not operating in automatic
 01-006083, Control Air dryer filters not working properly
 01-011949, Drywell Control Air Compressors excessive oil leakage and high vibration
 02-005474, Control Air line below ground leak
 02-002536, 2A Drywell Control Air Compressor showing adverse reliability trend
 02-008230, Negative trend for Unit 3 Drywell nitrogen usage
 02-000579, Control Air upward trend in particulate count
 02-012090, Control Air compressor failed to build pressure
 02-015540, G Control Air Compressor bearing failure

03-003007, G Control Air Compressor tripped on high oil pressure
 03-006847, D Control Air Compressor tripped and smoke coming from motor
 03-009209, Three of four Control Air compressors degraded

EDG PERs

01-000505, EDG minimum flash voltage calculation
 01-003281, Increased vibration levels during C EDG testing
 01-006911, EDG room air intake plenums found isolated
 01-008435, Failure of 7 day tank level switch to provide alarm
 01-009312, NRC identified air header crosstie valve out of position
 02-000274, 1D EDG generator cooling water chemistry adverse trend
 02-001897, Redundant start circuit on 3B EDG failed to operate
 02-002145, Unplanned EDG start during testing
 02-002149, Unplanned EDG start during testing due to auto start lockout
 02-005254, EDG A governor failed to respond to manual control
 02-011909, EDG B high temperature on B phase transformer connection
 02-012165, Review of diesel owner group Bulletin IB02-50 lead to identification of cracked welds on turbocharger air intake
 03-002656, EDG A exhaust fan failed to start
 03-015160, The Units 1 and 2 emergency diesel generators A and B auto-started while attempting to transfer the Shutdown Bus 1 to the alternate power supply when the alternate power supply breaker failed to close

HPCI PERs

02-005933, Unit 3 HPCI suction pressure at 55 psig resulting in increased radwaste inleakage
 02-008512, During performance of HPCI flow rate test an unusual loud noise was heard
 02-008497, Close stroke time for 2-FCV-73-2 trending upwards
 02-008800, Unit 2 suction valves transferred from CST to torus and test return valves 2-FCV-73-35 and 2-FCV-73-36 closed
 02-008883, During performance of Unit 2 HPCI flow test a leak occurred on pump discharge test return piping
 02-011069, During performance of HPCI flow rate test the HPCI stop valve, 3-FCV-73-18 was observed to operate erratically
 02-011914, During site review of chrome-moly materials installed to update FAC program several instances of incorrect materials installed in HPCI piping were identified
 02-011915, During site review of chrome-moly materials installed to update FAC program several instances of incorrect weld procedure or incorrect weld filler material were identified

Other PERs

00-006682, Appendix R RHR minimum flow valve closure timeliness
 01-004386, Technical Specification surveillance not performed
 02-012111, Air identified in RHR Loop I head spray line vent
 02-014508, Unauthorized computer server access
 02-015546, Procedure inadequate to perform multi-unit venting

02-015469, Procedure not available for pumping down drywell sumps
 02-015179, Personnel airlock door lock failed
 02-013222, Control Rod Drive system problems
 02-015702, Control Rod Drive system problems
 02-011145, Control Rod Drive problem
 03-004770, Valve stroke time not met
 03-004849, Valve failure and high nitrogen pressure alarm
 03-005615, PER processing issues
 03-005782, Adverse trend PER regarding MSRV leakage
 03-009232, Inoperable fire pump
 03-010896, Main Steam Isolation Valve relay failures
 03-005309, Recirculation Variable Frequency Drive (VFD) problems
 03-005485, VFD problems
 03-011196, Accessibility to operating experience database
 03-011912, Adverse trend for 2-FCV-74-99 and 101 failing to operate
 03-012356, VFD problem
 01-006911, Fire dampers in EDG room found closed
 02-000233, Inadvertent pull of RCIC switches
 02-003730, Valve 3-MVOP-73-16 traveled in wrong direction

Licensee Event Reports

260/2003-02, High pressure coolant Injection inoperability due to loss of turbine speed feedback signal
 260/2003-05, Unplanned start of diesel generator A and B due to momentary board undervoltage
 260/2002-02, Reactor trip due to main bank transformer bushing fault
 260/2002-03, Non-conservative Oscillation power range monitoring Tmin specification for units 2 and 3
 260/2001-03, Automatic scram from 100 percent power due to a main turbine trip from a power-load unbalance that occurred during combined intermediate valve testing
 296/2002-02, Two emergency diesel generators automatically started due to a de-energized condition on their respective shutdown boards
 296/2002-03, Valid initiation of the reactor protection system while shutdown
 296/2002-04, Loss of high pressure coolant injection flow controller power supply

Miscellaneous Documents

Work request history for RHRSW, 11/04/2001 through 11/04/2003
 Residual Heat Removal Service Water and Emergency Equipment Cooling Water System Status Report, 3rd quarter 2003
 Control Air System Status Report, 2nd Quarter 2003
 MPI-0-000-ACT001, Preventative Maintenance for Limitorque Operators

Root cause evaluations

00-004248, Failure to entry Tech Spec LCO 3.9.4, Action A, during control rod testing when rod 42-45 failed to meet acceptance criteria

- 01-012072 , During several lightening strikes in the BFN area the Unit 2 main turbine control valves closed and the bypass valves opened affecting reactor pressure
- 02-000330, Unit 2 main turbine intermediate valves 1 and 4 closed unexpectedly when valve actuator controller card failed
- 02-001795, Expectations of work implementation and documentation are not consistently met due to a lack of rigid adherence to maintenance procedure MMDP-1
- 02-008170, Some maintenance personnel could not demonstrate the ability to identify task qualifications that are associated with a given work scope due to being unaware of the task to training matrix
- 02-011914 Inappropriate materials installed
- 03-017441, Two failures of valve 2-FCV-43-14, containment isolation, to indicate properly during testing
- 02-002719, Valve 2-FCV-64-14, drywell/torus purge system, failed to close when a close signal was received
- 02-015637, Recirculating motor-generator set 3B tripped on low oil pressure during a lube oil pump swap
- 03-010550, Unit 1 MRC subcommittee PER processing issues
- 03-010586 Lack of snubber testing verification
- 03-019447, During the performance of a surveillance of the RHR Division 1 LPCI relay calibration the Core Spray 3A pump received an inadvertent start
- 03-012142, The 2B recirculating pump tripped when a second output module in the 2B variable frequency drive unit main controller failed

Maintenance Work Orders

- 01-012431, Implement design change to modify Unit 3 HPCI pipe support, corrective action for PER 00-07535-00
- 02-008513, Make repairs to Unit 2 pipe support 2-47B355R0026, found damaged, replace bent rod and baseplate fasteners at wall
- 02-008753, During start Unit 2 HPCI accelerated too fast resulting in a CST low level switch actuation and CST to Torus swap over, PER 02-008800-00 initiated
- 02-012348, Jet pump flow anomaly
- 02-012795, NRC inspector identified loose thermocouple seals in drywell
- 02-016209, Unit 3 instrument out of tolerance, low, HPCI turbine steam supply line high flow transmitter
- 02-016799, Unit 2 instrument out of tolerance, high, HPCI turbine steam supply line high flow transmitter
- 03-003737, Unit 2 HPCI steam supply inboard valve would not operate manually, valve operability not affected, valve would operate electrically
- 00-003356, Remove and reinstall valve actuator on Unit 3 HPCI steam supply outboard valve to support installation of new valve per design change
- 03-010787, Unit 3 HPCI overspeed trip tappet valve failed to reset, suspect grim in piston assembly, clean, repair, and/or replace, PER 03-009602-00 initiated
- 03-004848, Drywell vent valve 2-84-20 would not open
- 03-021575, Provide operator assistance to close RHRSW valve
- 03-006827, Control Air compressor tripped with motor fire damage
- 03-005213, On-line leak sealing of 2-FCV-1-156 (temporary alteration)
- 02-005472, Repair of Control Air through wall piping leaks

- 01-012004, Troubleshoot Unit 2 HPCI turbine trip and discharge flow low with 2-FCV-73-16 closed
- 03-004815, Unit 2 HPCI flow controller, 2-FIC-73-33, failed to control HPCI speed during startup
- 03-009601, Unit 3 HPCI stop valve, 3-FCV-73-18, failed to reopen after HPCI shutdown
- 03-009689, Unit 3 HPCI stop valve, 3-FCV-73-18, did not operate smoothly
- 03-018700, Unit 2 HPCI main steam line steam trap, 2-TRP-073-0005, steam leak

Industry Operating Experience Reports

- 02-002858, 10CFR21 notification on potential for inboard MSIVs stroke time to exceed required stroke time due to inside containment break LOCA conditions
- 02-009015, OE14359 and OE14392 chemistry control issues
- 02-005583, 10CFR21 notification regarding K-Line circuit breakers failure to charge and close
- 02-007238, IN 2002-22 degraded bearing surfaces on EMD diesel piston bearings
- 02-009015, Fatigue failure of clear plastic due to positive displacement pump pulsations
- 02-009170, Degraded steam dryer performance due to missing dryer outer bank hood cover plate at Quad Cities Unit 2
- 02-010160, 10CFR21 notification on Rotork valve actuators affected RWCU valve 1-FCV-69-1
- 03-000396, GE SIL 646, failure of Target Rock two stage MSR/V to fully open and reclose during reactor startup
- 03-002927, 10CFR21 notification on BWR stability option III to verify design basis for OPRM armed region
- 03-002995, IN 2002-34, failure of safety-related circuit breakers external auxiliary switches at Columbia Station
- 03-005840, GE SIL 647, voltage underrated Bussman MIN Series fuses
- 03-008558, Sequoyah Per 03-004354 (B level) turbine trip from high turbine vibration signal
- 03-011791, Three broken and one bent steam dryer tie rods identified in Browns Ferry Unit 3 during midcycle outage
- 03-013509, IN 2003-06, failure of safety-related line starter relays at San Onofre
- 03-019534, IN 2003-18, GE Type SBM control switches with defective cam follower switches at Columbia Station

Other Documents

- GE Field Deviation Disposition Report ER3-0802, Removal of Broken Browns Ferry Unit 3 Steam Dryer Tie Rods (related to PER 03-011791)

Performance Evaluation, Self- Assessments, Audits and Nuclear Assessment Section
Assessments

Assessment No. NA-CH-01-002 Nuclear Assurance Assessment of the TVAN Clearance Program found that corrective actions to prevent recurrence (for clearance problems) have not always been effective and effectiveness reviews have not been performed for level B PERs.

Assessment No. NA-BF-03-008 Unit 1 Restart Corrective Action Program Corrective Action Program Self Assessment WBN-SIT-03-001

Nuclear Assurance Observation Report 29436, Operation PER Trend Issues

Nuclear Assurance Observation Report 29225, Procurement Control

Nuclear Assurance Observation Report 27217, Maintenance program for line verification

Nuclear Assurance Observation Report 28408, Plant material condition

2003 Nuclear Assurance Audit on Program Health of Containment Closure Controls

Nuclear Assurance Observation Report 29219, Medium and low voltage circuit breaker program

Nuclear Assurance Observation Report 29899, Procurement process review

Nuclear Assurance Observation Report 28959, Corrective Action Program implementation and trending

Assessment No. NA-CH-03-001, Corrective Action Program Assessment

Browns Ferry System Health Trend Reports for 2003

Operating Units CAP trend report for 3rd quarter 2003

Oversight Analysis Report for January - June 2003

Unit 1 Self-Evaluation Program Trend Analysis Report, January 2003 through March 2003, April 2003 through June 2003, July to September 2003