

February 3, 2000

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: NRC INTEGRATED INSPECTION REPORT NO. 50-259/99-08, 50-260/99-08,  
AND 50-296/99-08

Dear Mr. Scalice:

This refers to the inspection conducted on November 28, 1999, through January 8, 2000, at the Browns Ferry Nuclear facility. The enclosed report presents the results of this inspection.

During the inspection period, your conduct of activities at the Browns Ferry Nuclear facility was generally characterized by safety-conscious operations, sound engineering and maintenance practices, and appropriate radiation controls and security measures.

Based on the results of this inspection, the NRC has determined that two violations of NRC requirements occurred. These violations are being treated as non-cited violations (NCVs), consistent with Appendix C of the Enforcement Policy. These NCVs are described in the subject inspection report. If you contest any of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region II, and the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC Public Document Room. Should you have any questions concerning this letter, please contact us.

Sincerely,

**/RA/**

Paul E. Fredrickson, Chief  
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  
Attachment A: Items Inspected in Section O7 of the Enclosed Inspection Report

cc w/encl: (See Page 2)  
cc w/encl:  
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cc w/encl continued: See page 3

TVA

3

cc w/encl: Continued  
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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 Nos: 50-259/99-08, 50-260/99-08, 50-296/99-08

Licensee: Tennessee Valley Authority (TVA)

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

Location: Corner of Shaw and Browns Ferry Roads  
Athens, AL 35611

Dates: November 28, 1999, through January 8, 2000

Inspectors: W. Smith, Senior Resident Inspector  
J. Starefos, Resident Inspector  
E. DiPaolo, Resident Inspector  
M. Scott, Reactor Engineer (Section O7)  
C. Smith, Reactor Engineer (Section O7)  
D. Payne, Senior Operations Engineer (Section O5)

Approved by: P. E. Fredrickson, Chief  
Reactor Projects Branch 6  
Division of Reactor Projects

Enclosure

## EXECUTIVE SUMMARY

Browns Ferry Nuclear Plant, Units 1, 2, and 3  
NRC Inspection Report 50-259/99-08, 50-260/99-08, 50-296/99-08

This integrated inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a 6-week period of resident inspection. In addition, inspections of the licensee's corrective action program and operator requalification training were performed.

### Operations

- Based on a licensed operator requalification program evaluation, the licensed operator requalification examination program simulator scenarios, JPMs, and written examinations were found to be challenging and effective test tools. The operators' performance during the site visit met the testing objectives. Examination security practices were satisfactory. The licensee requalification training feedback program for operational events was in place and effective. The licensed operator remedial training program was being administered in a timely and effective manner (Sections O5.1, O5.2, and O5.3).
- Based on a sampling of the corrective action process, the inspectors found that the corrective action program was effective in identifying and correcting problems and provided a useful risk-informed tool for the licensee (Section O7.1).
- Engineering support of the corrective action program was good. Site engineering personnel performed extent-of-condition reviews; root cause analysis, and apparent cause evaluations of plant problems in support of both maintenance and operations activities. Corrective action plans developed were technically adequate and provided reasonable assurance for effective control of the identified deficiencies (Section O7.1).
- Based on a review of maintenance work closures, four examples were identified where the field work on safety-related equipment had been completed and the required post maintenance testing (PMT) was not scheduled. In three instances, the required caution order indicating the need for PMT was not issued. In one instance, several barriers in the work control process failed and resulted in placing a secondary containment isolation valve in service following maintenance without the prescribed post-maintenance testing being performed. A non-cited violation (NCV) was identified for failure to meet PMT procedural requirements (Section O7.1).
- The licensee's efforts to manage the corrective action program using site-specific tools were effective. Licensee management fully participated in the program. The Management Review Committee was in the direct review path of the major input and output segment of the program (Section O7.2).

Maintenance

- The failure of several barriers in the work order process resulted in a breach of the Unit 2 HPCI lubricating oil system, rendering the HPCI system temporarily inoperable. An NCV was identified for failure to maintain adequate instructions for safety-related work (Section M1.1).

## Report Details

### Summary of Plant Status

Unit 1 remained in a long-term lay-up condition with the reactor defueled.

Unit 2 operated at or near full power during the inspection period with the exception of brief power reductions for routine planned maintenance and testing, and emergent issues described in this section. On December 15, 1999, Unit 2 began an unscheduled procedurally-required shutdown due to high cooling water conductivity in the main generator breaker cooling water system. The cause of the high conductivity was replacement of the system deionizer resin, which involved addition of ascorbic acid to the system for oxygen scavenging. After discussions with the vendor and taking actions to decrease the conductivity, the licensee discontinued the shutdown while at 75% power. The licensee continued to restore conductivity to within limits and power was restored to 100% on December 16. On December 17, the 2B reactor recirculation pump tripped causing power to decrease to approximately 61%. The cause of the pump trip was a failed relay in the control circuitry. The relay was replaced, the pump was returned to service, and full power operation was resumed. On January 2, 2000, power was reduced to 86% when the 2A5 low pressure feedwater heater isolated. The heater isolation was caused by a diaphragm failure on the air-operated level control valve. The heater was placed back in service and power was restored in approximately 3 hours.

Unit 3 operated at or near full power during the inspection period with the exception of brief power reductions for routine planned maintenance and testing.

## I. Operations

### **O5 Licensed Operator Requalification Program Evaluation**

#### **O5.1 Requalification Examination Development, Administration, and Grading**

##### **a. Inspection Scope (71001)**

The inspector reviewed the scope, quality, and level of difficulty of the licensee's annual operating tests and the biennial written examinations; and observed the licensee's evaluators administer operating tests and a written examination to nine senior reactor operators (SROs) and nine reactor operators (ROs). The inspector also evaluated the accuracy of the grading of these tests and evaluated the examination security practices of the licensee.

##### **b. Observations and Findings**

#### **Requalification Examination Test Materials.**

The inspector reviewed the annual requalification examination simulator scenarios, job performance measures (JPMs), and written examinations that were administered during the site visit for operational relevance, safety importance, and level of difficulty. In general, the inspector found that the examination materials met the guidelines of the licensee's examination development procedures. The inspector noted that a nominal,

but acceptable, duplication of selected test items was present between examination weeks.

The inspector found that the annual simulator scenarios were comprehensive and challenging. The administered scenarios allowed for the determination of acceptable operator performance. Each scenario was a logical sequence of minor plant equipment malfunctions leading to a major plant transient. Similarly, the JPMs used during the examination were representative of the normal, abnormal, and emergency tasks which the operators are expected to be proficient in performing while on shift. Each written examination (RO and SRO) consisted of 50 questions. These questions were generally well-written and tested operator knowledge at the higher cognitive level.

### **Requalification Examination Administration**

The inspector observed the licensee administer five simulator scenarios to two operating crews with three ROs and three SROs each. Overall performance of each team was considered to be satisfactory. The inspector found the licensee's evaluators to be proficient at identifying operator performance errors. One member of each evaluation team was an Operations representative. The inspector noted that these individuals provided additional insight and perspective to the evaluation team. The inspector also observed the administration of simulator JPMs, plant JPMs and the written examination. No deficiencies were noted.

The inspector observed examination security practices during the inspection. The licensee maintained a separate examination development room with limited personnel access. The inspector noted that the licensee used a combination of operator sequestration and changing test materials to maintain examination integrity during administration. This was an acceptable practice.

### **Requalification Examination Grading**

The inspector reviewed the examination grading for each crew and operator as documented by the licensee's evaluators. Specific crew and individual strengths and weaknesses were identified and documented by the evaluators in their reports. Two operators (one RO and one SRO) failed the written examination. Each was removed from shift pending remediation and satisfactory retesting consistent with programmatic and regulatory requirements. The inspector found the documentation of operator performance to be comprehensive and the grading to be accurate.

#### **c. Conclusions**

The licensed operator requalification examination program simulator scenarios, JPMs, and written examinations were found to be challenging and effective test tools. The operators' performance during the site visit met the testing objectives. Examination security practices were satisfactory. This portion of the licensed operator requalification program met the requirements of 10 CFR 55.59, "Requalification."

#### **O5.2 Requalification Program Training Feedback Process**



a. Inspection Scope (71001)

The inspector reviewed the operating history of Units 2 and 3 for the last six months to verify that feedback from plant operational events had been incorporated into the licensed operator requalification program and into the testing sample plan.

b. Observations and Findings

The inspector's review identified that the licensed operators had experienced difficulties in applying Improved Technical Specifications (ITS) for various equipment problems. The training staff informed the inspector during interviews that ITS interpretation problems had been identified as an area for improvement in operator performance. The inspector reviewed training records and noted that the licensee had devoted a substantial (about 13%) amount of the available classroom contact hours on ITS training. The hours spent on ITS training was three times that spent on the next most time-intensive topic area - emergency operating procedure training. The inspector also noted that classroom instruction was allocated to review Special Operational Event Reports and Safety Evaluation Reports. The inspector confirmed that this training was adequately covered during the annual operating tests and biennial written examinations.

c. Conclusions

The inspector concluded that the licensee requalification training feedback program for operational events was in place and effective. This portion of the licensed operator requalification program met the requirements of 10 CFR 55.59.

O5.3 Requalification Program Remedial Training Process

a. Inspection Scope (71001)

The inspector reviewed the remedial training packages for operators who had failed part of their annual operating or biennial written examinations to verify the adequacy, effectiveness, and timeliness of the training.

b. Observations and Findings

The inspector reviewed the remedial training package for one team of six licensed ROs and SROs that had failed the simulator portion of their operating test (during a previous testing week) as well as the package for one RO and one SRO who had failed the written examination during the site visit. The inspector found that each training package adequately covered the areas where weaknesses had been identified. The inspector noted that each operator completed the remedial training within one week and successfully passed a remedial examination comparable to the examination the operator had previously failed.

c. Conclusions

The inspector concluded that the licensed operator remedial training program was being administered in a timely and effective manner. This portion of the licensed operator requalification program met the requirements of 10 CFR 55.59.

## **O7 Quality Assurance in Plant Operations**

### **O7.1 Review of the Problem Evaluation Report (PER) Process and Problem Resolution**

#### **a. Inspection Scope (40500)**

The inspectors reviewed the licensee's process for identifying, documenting, and responding to problems as established under 10 CFR 50, Appendix B and the licensee's Quality Assurance Program. The licensee routed the focused output of their maintenance, engineering, and operational problems; industry event data; Browns Ferry event data; equipment failures; corrective action audit findings; self-assessment findings; and corrective action failures through the PER program and their work order (WO) system. Prior to the inspection, the inspectors screened samples of PERs. The selected PERs were evaluated for the following attributes:

- Timeliness of response
- Significance determination
- Quality of evaluation
- Operability questions
- Effectiveness of corrective action
- Proper cause determination (apparent and/or root)
- Accuracy of information
- Reviewed within administrative time limits
- Proper action time extensions
- Compliance with reporting requirements

The inspectors sampled the program output in the following areas. The sampled documents and procedures utilized are listed in Attachment "A" to this report.

- The licensee's corrective actions for non-cited violations over the last year were evaluated.
- Selected additional PERs were reviewed for proper risk assessment and management attention.
- Quality assurance audits and self assessment reports were reviewed for compliance with requirements. The PERs generated due to the reports were sampled to ensure that the PERs were issued and that their corrective actions were in the tracking system.
- Canceled PERs were evaluated for valid closure.
- Operating experience action items were evaluated to ensure that they were being appropriately incorporated into plant procedures and activities.
- The operational work-around list process was evaluated for effectiveness and impact on operations.
- The licensee's safety-related and risk-important system status was evaluated to ensure that the documentation presented actual plant conditions and directed the

focus and the licensee's evaluative resources to equipment needing attention. This review sampled for repetitive equipment problems.

- The licensee's assessment and trending of operational mis-positioning occurrences were scrutinized for significance and proper corrective actions.
- Engineering operability determinations performed on major plant problems were evaluated for technical correctness.
- Risk sensitive WOs greater than one year old were evaluated for timeliness and proper closure.
- Mechanical WOs on two safety-related systems, Unit 3 diesel generator (DG) and the Unit 2 high pressure coolant injection (HPCI) system, were evaluated for proper work identification and completion. The inspectors walked down the reviewed systems to determine that equipment status was properly understood by the licensee and that the equipment agreed with the WO status.

b. Observations and Findings

Based on the scope of the inspection detailed above, the following inspection results were obtained:

- The overall corrective action program was functional and met regulatory requirements.
- The inspectors reviewed the licensee's Operations-controlled work-around list. The list was developed and maintained by the Operations organization to formally document challenges to operators during all modes of operation. At the time of the inspection, operational compensatory actions were identified and understood by the control room operators interviewed by the inspectors. The inspectors also determined that the licensee had either identified the corrective actions, or was in the process of identifying corrective actions that would reduce the number of operator work-arounds.
- The inspectors evaluated system status utilizing several methods. Safety-related and equipment important to plant safety were evaluated by review of maintenance trending reports, system health reports, and the engineering plant equipment issues list. The inspectors evaluated the output of these tools and found that it was providing management with the necessary information about equipment condition. During plant walk downs and technical discussions, the interviewed system engineers were knowledgeable about their respective systems' conditions and long term needs. As identified by several licensee source documents, components for the DGs were no longer available for purchase. These components had few ready spares. Further, several long term issues such as the control bay chillers (CBCs) and the main steam relief valves (MSRVs) continue to require attention. The CBCs, which had been recently included in the plant Technical Specifications (TSs), were under review for replacement and additional maintenance. The MSRVs had continuing problems that were being addressed by the licensee and the owners' group. Also, trend information on failing or degrading components was readily available to management.

- Nuclear Assurance (NA) assessments and the general sampled departmental self-assessments were of good quality and produced findings that tracked into the general PER corrective action program. Two NA assessments titled, “Power Reductions Caused by Component Failures,” and, “Assessments of Transient Precursors,” performed in the latter part of 1999, were incisive and risk-significant in their evaluation. Both assessments contained open corrective actions that were being properly tracked in the program.
- The inspectors reviewed corrective actions documented in PER 99-80094, which were prepared for retracting the licensee’s one-hour notification made on January 21, 1998, under 10 CFR 50.72(b)(ii)(A), “an event or condition during operation that results in the nuclear plant being in an unanalyzed condition that significantly compromise safety.” The corrective actions described were verified to have been completed. In addition, plant modification T40713A and supporting calculations developed and implemented to resolve reactor core isolation cooling (RCIC) high energy line break (HELB) inside the steam valve vault after power uprate were reviewed and verified to have been completed.
- Review of operational mis-positioning occurrences revealed that no significant events were caused by operator errors. Corrective actions for this sampled occurrences were properly documented. The relative number of occurrences was low between the units.
- Evaluation of canceled PERs revealed no substantive problems. All reviewed PERs were appropriately dispositioned.
- Review of open WOs generally indicated that equipment deficiencies were being properly identified and given proper work priority. However, the inspectors identified several examples where proper work closure did not occur. On December 2, 1999, the inspectors reviewed open WOs for the HPCI system and all plant mechanical maintenance WOs remaining open due to incomplete post-maintenance testing (PMT). The inspectors identified four examples on Units 1 and 2 where the field work on safety-related equipment had been completed but the required PMT was not performed nor scheduled. In three instances, the required caution order, which would indicate the need for PMT, was not issued. These were as follows:
  - 1) WO 96-016182-000, investigate, repair, lubricate, and adjust Unit 1A 4-Kilovolt (Kv) shutdown board room air handling unit backdraft damper. The field work was completed on November 2, 1999. However, the prescribed PMT was not scheduled and the required caution order was not issued. Subsequently, the equipment was returned to service.
  - 2) WO 99-003284-000, replace 2A 4-Kv shutdown board room air conditioning unit temperature control valve 2-TCV-067-0891A. The field work was completed on November 2, 1999. However, the prescribed PMT was not scheduled and the required caution was not issued. Subsequently, the equipment was returned to service.

- 3) WO 99-005656-000, perform re-torque of fasteners on Unit 2 HPCI turbine components to correct mechanical steam leaks. Although the field work was completed in August 1999, the prescribed PMT was not scheduled for the next operation of the HPCI system. As a result, the PMT was not performed during HPCI system operation on October 27, 1999.
- 4) WO-99-008432-000, replace diaphragm in damper operators and inspect damper for Unit 1 refueling zone air supply outboard isolation valve. The field work was performed on November 19, 1999. However, the prescribed PMT was not scheduled and the required caution tag was not issued. This damper, a secondary containment isolation valve (SCIV), was returned to service on November 23, 1999. On December 3, 1999, the inspector found the damper in service and the PMT had not yet been performed, nor scheduled. Upon notification, the operators entered TS Limiting Condition for Operation (LCO) 3.6.4.2, which required isolation of the damper. The PMT was performed with satisfactory results later that evening and the TS LCO was exited. Because of the licensee's failure to identify the pending PMT by scheduling, or flagging with a caution order, operability was not assured until the inspector identified the problem 2 weeks after completion of work that could have affected the operability of the SCIV.

Review of the events leading up to placing the SCIV in service revealed that several other licensee barriers failed. The licensee determined that the SRO authorizing the work did not enter the SCIV into the LCO Tracking Log, even though the work rendered the SCIV inoperable. Previously, on November 19, 1999, another SRO released the hold order for the work and failed to determine all the required PMTs. In addition, the maintenance planning meeting periodic review of outstanding PMTs failed to identify the need to perform the PMT on the SCIV.

TS 5.4.1.a requires that written procedures shall be implemented covering the applicable procedures of Regulatory Guide 1.33, Revision 2. Regulatory Guide 1.33, Appendix A, requires procedures for performance of maintenance. Standard Programs and Processes (SPP) 6.3, Pre-/Post-Maintenance Testing, Revision 0, contained the licensee's administrative requirements for post-maintenance testing. The above examples represent a violation of Step 3.5.D of SPP 6.3, which required that PMTs not performed at the time of field work completion be scheduled for completion. In addition, three of the above examples required a caution order indicating the need for PMT performance because the equipment was returned to service and the PMT could not be performed at the time of field work completion. This was required by Step 3.5.I of SPP 6.3. This Severity Level IV violation is being treated as a non-cited violation (NCV), consistent with Section VII.B.1 of the NRC Enforcement Policy and is identified as NCV 50-259,260/99-08-01, Failure to Meet Post-Maintenance Test Requirements. This violation is in the licensee's corrective action program as PERs 99-013001, 99-013143 and 99-013198.

c. Conclusions

Based on a sampling of the corrective action process, the inspectors concluded that the program was effective in identifying and correcting problems and provided a useful risk-informed tool for the licensee.

Engineering support of the corrective action program was good. Site engineering personnel performed extent-of-condition reviews; root cause analysis, and apparent cause evaluations of plant problems in support of both maintenance and operations activities. Corrective action plans developed were technically adequate and provided reasonable assurance for effective control of the identified deficiencies.

Contrary to procedural requirements, the inspectors identified four examples where the field work on safety-related equipment had been completed and the required PMT was not scheduled. In three instances, the required caution order that would indicate the need for PMT was not issued. In one instance, several barriers in the work control and LCO tracking process failed and resulted in placing a secondary containment isolation valve in service following maintenance without the prescribed post-maintenance testing being performed. An NCV was identified for failure to comply with post-maintenance testing procedural requirements.

O7.2 Management Involvement in Corrective Action Process

a. Inspection Scope (40500)

The inspectors reviewed the process and internal controls for implementing the corrective action program.

b. Observations and Findings

Through reviews of documentation and interviews with station personnel, the inspectors determined that station management responded positively to NA assessment and audit findings and recommendations in making improvements to the corrective action process. Management had directed that a number of assessments be performed to evaluate the program. These self assessments were in addition to the audits performed in accordance with the requirements of 10 CFR 50, Appendix B, Criterion XVIII, and provided real time information concerning the adequacy with which the corrective action program was being implemented. Each generated PER was reviewed daily (on weekdays, and within three working days of being generated) by the Management Review Committee (MRC), a site management team. The inspectors observed MRC proceedings and the resident inspectors regularly attended the meetings. The process was time consuming, but the inspectors understood the consistency and value such a diverse team review provided.

c. Conclusions

The licensee's efforts to manage the corrective action program using site-specific tools were effective. Licensee management fully participated in the program. The MRC was in the direct review path of the major input and output segment of the program.

## **O8 Miscellaneous Operations Issues (92901)**

- O8.1 (Closed) Inspection Follow-up Item (IFI) 50-260,296/1998-02-05: Use of Personnel in Place of Equipment Clearances. Inspection report 50-259,260,296/1998-02 documented a concern that the Fix-It-Now (FIN) team had used Operations personnel to ensure that a component (e.g., valve, switch, or breaker) was maintained in a safe position instead of using a documented clearance and attaching a hold tag. One example of this practice was identified. This IFI was generated to readdress this concern following licensee evaluation. Since the concern was identified, the site-specific equipment clearance procedure was superseded by a clearance program procedure which applies to all operational TVA nuclear plants. The inspector reviewed the currently applicable procedure, SPP-10.2, Clearance Program, Revision 1, and determined that routine use of personnel in place of equipment clearances was not permitted. In addition, discussions with plant personnel indicated that the FIN team used the approved plant clearance process to clear equipment for work.

### **II. Maintenance**

#### **M1 Conduct of Maintenance**

##### **M1.1 Loss of Safety Function Due to System Breach**

###### **a. Inspection Scope (62707)**

The inspectors reviewed the licensee's actions in response to a series of problems that led to the inoperability of the Unit 2 HPCI system.

###### **b. Observations and Findings**

On November 18, 1999, while Unit 2 was operating at full power, maintenance craftsmen obtained Operations' concurrence to replace HPCI lubricating oil temperature switch 2-TS-73-52 without a clearance. The switch had been damaged in the recent past, and was causing an invalid control room alarm. The WO package (WO 99-010579-000) contained a drawing that showed the switch installed on a dry thermal well; therefore, the work was not to affect HPCI system operability.

When the craftsmen removed the broken switch from what was thought to be a thermal well, they noticed oil on the sensor, and recognized that they had breached the system. There was no thermal well. The craftsmen promptly closed the system by temporarily installing the new switch, without thread sealant. Instead of promptly informing the control room operators, the craftsmen returned to the shop to obtain thread sealant, and informed their foreman. After about an hour, the maintenance foreman informed the operators that the breach had occurred, but that the system was restored. PER 99-012688-000 was initiated to identify the work package error indicating an installed thermal well when, in fact, there was no thermal well. Operations personnel reviewed the PER, but did not recognize that HPCI was rendered inoperable by the breach of the lubricating oil sub-system until November 22, when the PER was reviewed by licensing and the MRC.

The licensee formed an event investigation team. The inspectors noted that the team identified several barriers to failure that had been broken. For example:

- The work package contained a Unit 3 drawing, showing a thermal well (which did exist on Unit 3, but not on Unit 2). The planner's inattention to detail, coupled with an ineffective review failed to identify the wrong unit drawing.
- Because this work was pulled ahead of schedule, the physical walkdown of the prospective job was not done, though, it would have been difficult to notice the absence of a thermal well, because the existing bushing was labeled as a thermal well.
- The foreman and craft review of the work package failed to reveal the wrong unit drawing.
- When authorizing the work, the operators had an opportunity to notice the wrong unit drawing, while evaluating the need for a clearance.
- When the lubricating oil sub-system was unexpectedly breached upon removal of the switch, the craftsmen failed to immediately inform the operators, so that HPCI could be declared inoperable and a post-maintenance test specified.
- When the foreman finally informed the operators, a breakdown in communications occurred such that the operators did not become aware that HPCI had been inoperable, which was a reportable event, and that a post-maintenance test was required.
- The subsequent review of PER 99-012688-000 for operability/reportability impact by the shift technical advisor on November 19 failed to identify this issue.
- As of November 22, the MRC had not formally reviewed the PER. As a result of a Licensing representative questioning the PER submittal indicating no operability/reportability impact, on November 22, the MRC recognized the potential loss of HPCI event.

After further review, on November 22, the licensee executed a 4-hour report to the NRC, pursuant to 10 CFR 50.72, stating that for about 5 minutes, a condition existed that alone could have prevented the fulfillment of the safety function of a structure or a system needed to mitigate the consequences of an accident. On December 17, LER 50-260/1999-011-000 was published on the same subject.

The inspectors noted that the licensee took immediate corrective actions to ensure that plant personnel involved with the work order process were sensitive to their individual and collective responsibility to maintain barrier integrity. The event investigation team identified the root cause as the use of the drawing from the wrong unit (Unit 3), which was in the work package. Contributing causes were principally inattention to detail on the part of licensee personnel involved with the work order process. The licensee's corrective actions as to the causes were acceptable; however, this event demonstrated that multiple barriers placed in a process designed to assure the safe conduct of work,



completion of testing, and return to service on safety-related equipment can and have been broken. As a result, a loss of safety function existed on an operating unit.

The safety significance of this event was minor from the perspective that TS LCO 3.5.1 allows HPCI to be inoperable for up to 2 weeks during plant operation, provided reactor core isolation cooling is operable. The LCO was met because HPCI was inoperable for approximately 5 minutes; however, the operators were not aware that this single train safety function was inoperable at the time.

Failure to maintain Work Order 99-010579-000 adequate to correctly perform the intended work on safety-related equipment was a violation of TS 5.4.1.a. This Severity Level IV violation is being treated as an NCV, consistent with VII.B.1 of the NRC Enforcement Policy. This violation is identified as NCV 50-260/99-08-02, Failure to Maintain an Adequate Procedure. This problem was entered into the licensee's corrective action program as PER 99-012688-000.

c. Conclusions

The failure of several barriers in the work order process resulted in a breach of the Unit 2 HPCI lubricating oil system, rendering the HPCI system temporarily inoperable. An NCV was identified for failure to maintain adequate instructions for safety-related work.

- M8.1 (Closed) Licensee Event Report LER 50-260/1999-011-000: High Pressure Coolant Injection (HPCI) Inoperable Due to Oil System Breach. This issue was discussed in Section M1.1 above. An NCV was identified for failure to maintain an adequate work instruction, as required by TS 5.4.1.a. The inspectors reviewed the LER and found no additional issues.

### **III. Management Meetings**

#### **X1 Exit Meeting Summary**

The resident inspectors presented inspection findings and results to licensee management on January 14, 2000. An exit meeting was also conducted on December 3, 1999, to discuss the scope, methodology, observations, findings and conclusions of the corrective action program inspection. The inspector presented the inspection results of the requalification training inspection to members of licensee management at the conclusion of the site visit on December 10, 1999. The licensee acknowledged the findings presented. The licensee did not identify any of the materials reviewed during this inspection as proprietary.

### **PARTIAL LIST OF PERSONS CONTACTED**

#### Licensee

T. Abney, Licensing Manager  
 T. Albright, Simulator Manager  
 A. Bhatnagar, Site Support Manager  
 D. Campbell, Lead Requalification Instructor  
 R. Coleman, Radiological Control Manager  
 J. Corey, Radiation Protection and Chemistry Manager  
 J. Grafton, Site Quality Assurance Manager  
 J. Herron, Site Vice President  
 R. Jones, Plant Manager  
 R. LeCroy, Site Security Manager  
 R. Rogers, Maintenance Superintendent  
 G. Little, Operations Manager  
 R. Moll, System Engineering Manager  
 W. Nurnberger, Chemistry Superintendent  
 D. Olive, Operations Superintendent  
 D. Sanchez, Training Manager  
 J. Schlessel, Maintenance Manager  
 J. Shaw, Design Engineering Manager  
 R. Wiggall, Site Engineering Manager

### INSPECTION PROCEDURES USED

IP 37551	Onsite Engineering
IP 40500	Effectiveness of Licensee Process to Identify, Resolve, and Prevent Problems
IP 61726	Surveillance Observations
IP 62707	Maintenance Observation
IP 71001	Licensed Operator Requalification Program Evaluation
IP 71707	Plant Operations
IP 71750	Plant Support Activities
IP 92901	Followup - Plant Operations
IP 92902	Followup - Maintenance

### ITEMS OPENED AND CLOSED

#### Opened and Closed

50-259,260/99-08-01	NCV	Failure to Meet Post-Maintenance Test Requirements (Section O7.1).
50-260/99-08-02	NCV	Failure to Maintain an Adequate Procedure (Section M1.1).

#### Closed

50-260,296/98-02-05	IFI	Use of Personnel in Place of Clearances (Section O8.1).
50-260/1999-011-000	LER	High Pressure Coolant Injection (HPCI) Inoperable Due to Oil System Breach (Section M8.1).

## Attachment A

### Items Inspected in Section O7

#### Reviewed Non-Cited Violations (NCVs)

NCV 260,296/99-01-01, Surveillance Procedure Results in Both Trains of [Control Room Emergency Ventilation] CREV being Inoperable - PER 99-000804

NCV 260,296/99-01-04, Failure to Establish Procedures to Properly Test CREV System Logic - PER 99-001227

NCV 260/99-02-02, Failure to Meet residual heat removal (RHR) Service Water (SW) System Discharge Temperature Limitation - PER 99-004430

NCV 260/99-02-04, Failure to Perform a Safety Evaluation for HPCI Testing - PER 99-002311

NCV 296/99-04-01, Failure to Select Correct Core Spray Pump for Testing - PER 99-007296

NCV 260,296/99-04-03, Failure to Maintain and Implement Containment Atmospheric Dilution System Calibration Procedure - PER 99-007219

#### Selected Problem Evaluation Reports (PERs) Reviewed

PER 99-000097, Associated with emergency drill exercise weakness associated with Protective Action Recommendation causing failure to meet objective of drill

PER 99-010348, Associated with taking source range monitor readings hours before the commencement of the rod pull to criticality under different plant conditions. Resulted in non-conservative calculations of when to commence single notch withdrawal

PER 99-008006, Trend PER for DG air bank compressor problems

PER 99-008367, Procedure 2-TI-141 incorrectly revised using non-intent change process. Conflict with SPP 2.2

PER 99-007442, High density spent fuel rack slider pad assemblies on refueling floor do not have traceability to original procurement/issue documentation

PER 99-008568, Degrading pump discharge head for RHR 2C pump

PER 95-1438, 3C DG left bank air start motor hose failure

PER 99-010319, 3D DG low lube oil outlet temperature alarm switch 3-TS-82-191 wired incorrectly

PER 98-00565, Coefficients for the TAU calculation are incorrect in both Units 2 and 3 Core Operating Limits Report

PER 98-005317, Moisture separator normal level control valves 2, 3-LCV-6-62A, B, and 84A, B, (Fisher control Model #A-4) are experiencing sticking problems and not controlling levels causing dump valves to open

PER 98-005206, An upward trend exist for out of calibration problems for Robertshaw Controls model # 613B type pressure switches

PER 98-014923, 3A reactor zone exhaust fan has high vibrations that are greater than the high alarm setpoint

PER 98-014340, Unit 3 HPCI steam supply line high vibration

PER 98-00094, Enhanced computer code used for environmental qualification (EQ) analysis identified higher temperature during EQ analysis

PER 97-00486, At 10:40 on 3/5/97 Unit 3 experienced a loss of all 161 Kv offsite power

PER 98-00286, Safety Assessment/Evaluation for change to Final Safety Analysis Report section 12.2.9.3.2 not adequate

#### Repetitive Equipment Problems

PER 99-002311, HPCI MOVATS valve testing

PER 99-004221, HPCI turbine stop valve erratic operation (open)

PER 99-001227, CREV flow transmitter switch

PER 98-005689, 2A spent fuel pool discharge check valve problem

PER 98-005482, B3 RHRSW pump impeller problems

Preventive Maintenance (PM) Section - Trend Report, January, February, March 1999, issued June 7, 1999 [PERs 99-002495, PER 99-003367, PER 99-002371]

PER 99-002371, Emergency equipment cooling water pump discharge flow transmitters harsh environment

#### Oldest PERs, greater than one year

PER 98-000171, CBC water system water quality - impact on chiller performance (open)

PER 98-013101, During medium and low voltage breaker assessment, inadequate PM justification for GE AK breakers under SIL 448 was found (open)

#### Operating Experience Action Items

10 CFR 21 - ESI, DG air start solenoids, PER 98-000149

GE PRC 96-34 (Safety Concern 97-02), Possible Failure of Hex head Screws in GE Type AK 15 AND 25 Circuit Breakers, PER 98-012811(open)

Operation Event 10379 - Early Criticality During Reactor Startup [PER 99-010348 relates]

Flooding of 6.9-Kv boards, PER 99-006863 (Sequoyah, with Browns Ferry continuation form S11991022809)

During Breaker Assessment of GE type AK breakers vendor recommendations not rolled into preventive maintenance, PER 99-013101 (open PER with actions stemming from PER 98-007420)

PER 99-0002371, Generic Letter 95-07 regarding potential pressure locking of RCIC valves [TOE 99-71-2371 relates]

#### Self Evaluations

December 1998 Freeze Protection - PER 98-015734 (open)

June/July/August 1999 Operations Self-Assessment and associated PERs:  
 Operations Manger top ten issues - PER 98-008294  
 Test Handling Deficiencies - PER 98-008432

March 1999 Operations Self-Assessment and associated PERs :  
 PER 99-002820 - Inadequate 2-SR-3.3.5.1.6 test  
 PER 99-002831 - Assessment NA-BF-99-003 corrective action  
 PER 99-003100 - Calculated fuel loading values should be investigated  
 PER 99-003308 - Surveillance test did not indicate LCO entry  
 PER 99-003560 - 4-Kv shutdown board transfer with 1A Reactor Protection System (RPS) Bus in alternate  
 PER 99-002018 - Compliance instrument, 2-XR-64-50 found out of tolerance high

November 1998 Maintenance/Modification Self-Assessment Report and associated PERs :  
 PER 98-013346, Finding against design change notice (DCN) closure process  
 PER 98-013101, Document was issued to evaluate unjustified PM frequency changes (open, PER 99-011793 relates)

Canceled PERs

PER 98-005317, Moisture separator level control adverse trend [rolled into PER 98-005320 (open)]

PER 99-008205, Potential Adverse Trend in Maintenance, program and procedure adherence [rolled into PER 99-008251 (open)]

PER 99-007352, RPS circuit protector tripping and RPS transformer making an unusual noise [rolled into PER 99-007021 (open)]

PER 99-007762, Dimensional checks performed by Quality Control personnel did not meet drawing requirements [action closed by PER 99-007757]

Operability Determinations, Technical Operability Evaluations (TOEs)

TOE No. 3-98-073-14340, Revision 0, System 073, U3 HPCI Support (3-47B455-635), U3 HPCI Turbine ( BFN-3-TRB-073-0054);

TOE No. 3-98-071-0094, Revision 0, Reactor Core Isolation Cooling system , High Pressure Coolant Injection, Main Steam Break Detection Systems and various pieces of 10 CFR 50.49 equipment.

TOE No. 0-98-082-0326, Revision 0, Emergency Diesel Generator A Overload Relay 51X-082-2547A/1.

PER 98-000804, A and B trains CREV

Plant Modifications and Supporting Calculations

Design Change Notice (DCN) No. T40713A, Cut Out and Replace Valves with Newer Design, dated May 4, 1998

SAR Change Request No. 17-113, Clarifies Assumption for Main Steam Valve Vault Pressure and EQ Analyses

Calculation No. ND-Q-3999-970012, Revision 0, Reactor Building Environmental Analysis for High Energy Line Breaks- Power Uprate

Calculation No. CD-Q-3999-950476, Revision 3, Pipe Rupture Evaluation for the BFNP Unit 3 Restart

Calculation No. CD-Q-3999-950377, Revision 4, BFN Unit 3 Piping Break/Crack Location and Stresses

Calculation No. ND-Q2999-970011, Revision 0, Reactor Building Environmental Analysis for HELBs-Power Uprate

Calculation No. BFN-50-7105, Revision 4, Pipe Rupture Evaluation Program for Inside and Outside Primary Containment for the Browns Ferry Nuclear Plant Units 2 and 3

Audits/NA Assessments

NA-BF-99-047, Power Reductions Caused by Component Failures (open)

NA-BF-99-043, Assessment of Transient Precursors (open)

NA-BF-99-021, NEDP 1, Predictive Maintenance, June 1999 - PER 99-005398

Mispositions - (21 in two years, 14 Level B)

PER 99-004113, Two written WOs, 99-004114-000 and 4151-000

PER 98-01528, Two alternate decay heat removal components out of position

PER 98-015766-000, 3 DG dryer moisture trap left closed

Work Order/Work Order Reports

Open work order list for Unit 2 HPCI system

Open work order list for Unit 3 diesel generators

List of work orders in post-maintenance testing status

WO-99-005656-000, retorque HPCI flange fasteners

WO-99-008432-000, replace diaphragm in damper operators and inspect damper for Unit 1 refueling zone air supply outboard isolation valve

WO 96-016182-000, investigate, repair, lubricate and adjust Unit 1A air handling unit backdraft damper

WO 99-003284-000, replace shutdown board room air conditioning unit temperature control valve 2-TCV-067-0891A

Procedures Used in Inspection

Corrective Action Program, SPP-3.1, Revision 1

Conduct of Operations, SSP-12.1, Revision 37A

Engineering Evaluations for Operability Determination, SPP-10.6, Revision 2

Pre-/Post-Maintenance Testing, SPP-6.3, Revision 0

Clearance Program, SPP-10.2, Revision 1



RHRSW Sump Pump Flow Rate Test, 0-TI-171, Revision 4

Maintenance Management System, MMDP-1, Revision 1

Equipment Failure Trending, NEDP-12, Revision 1

Emergency Equipment Cooling Water and Residual Heat Removal Service Water Pump  
(Byron Jackson Type KX) Disassembly, Inspection, Rework and Reassembly,  
MCI-0-023-PMP002, Revision 32