



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-259/89-08, 50-260/89-08, and 50-296/89-08

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

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

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

Facility Name: Browns Ferry Units 1, 2, and 3

Inspection at Browns Ferry Site near Decatur, Alabama

Inspection Conducted: February 1 - 28, 1989

Inspector:

D. R. Carpenter, MRC Site Manager

4-6-89

Date Signed

Accompanied by:

E. Christnot, Resident Inspector
W. Bearden, Resident Inspector
K. Ivey, Resident Inspector
A. Johnson, Project Engineer

Approved by:

W. S. Little, Section Chief,
Inspection Programs,
TVA Projects Division

4/6/89

Date Signed

SUMMARY

Scope: This routine resident inspection included the areas of operational safety, verification, surveillance observation, reportable occurrences, restart test program, licensee action on previous enforcement matters, site management and organization, and followup of open inspection items.

Results: Two violations were identified:

260/89-08-01: Failure to Follow Procedure by not Removing a Jumper Installed During an IRM Surveillance, paragraph 2

259, 260/89-08-02: Failure to Perform Weekly Surveillance on Shutdown Board Batteries, paragraph 2

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One unresolved item was identified:

259/89-08-03: Loss of Approximately 200,000 Gallons of Potentially Contaminated Water From the CST Via the Condensate Head Tank, paragraph 4.

Both of the identified violations and the unresolved item must be resolved prior to Unit 2 restart.

The NRC inspectors have noted continued poor licensee performance in the area of surveillances. During the last several reporting periods there have occurred numerous examples of enforcement actions associated with the adequacy and compliance with surveillance procedures and failure to perform periodic surveillance tests.

Paragraph 4 summarizes the events associated with the unmonitored loss of 200,000 gallons of potentially contaminated water from the Unit 1 Condensate Storage Tank. Although the licensee's evaluation of the event determined that 10 CFR 20 limits were not exceeded, the NRC inspectors are concerned that TVA licensed operators failed to adequately followup on what appeared to be either loss of water level or failed level instruments.

REPORT DETAILS

1. Persons Contacted

Licensee Employees:

O. Kingsley, Jr., Senior Vice President, Nuclear Power
C. Fox, Jr., Vice President and Nuclear Technical Director
*J. Bynum, Vice President, Nuclear Power Production
*C. Mason, Acting Site Director
*G. Campbell, Plant Manager
H. Bounds, Project Engineer
*J. Hutton, Operations Superintendent
*D. Phillips, Maintenance Superintendent
*D. Mims, Technical Services Supervisor
G. Turner, Site Quality Assurance Manager
*P. Carrier, Site Licensing Manager
*J. Savage, Compliance Supervisor
A. Sorrell, Site Radiological Control Superintendent
R. Tuttle, Site Security Manager
L. Retzer, Fire Protection Supervisor
T. Bradish, Plant Reporting Section
H. Kuhnert, Office of Nuclear Power, Site Representative
T. Valenzano, Restart Director

*Attended exit interview

Other licensee employees or contractors contacted included licensed reactor operators, auxiliary operators, craftsmen, technicians, and public safety officers; and quality assurance, design, and engineering personnel.

NRC Attendees

D. Carpenter, Site Manager
E. Christnot, Resident Inspector
W. Bearden, Resident Inspector
A. Johnson, Project Engineer

Acronyms used throughout this report are listed in the last paragraph.

2. Surveillance Observation (61726)

The inspectors observed and/or reviewed the Surveillance Instruction (SI) procedures discussed below. The inspections consisted of a review of the SIs for technical adequacy and conformance to Technical Specification (TS), verification of test instrument calibration, observation of the conduct of the test, confirmation of proper removal from service and return to service of the system, and a review of the test data. The inspector also verified that limiting conditions for operation were met,



testing was accomplished by qualified personnel, and the SIs were completed at the required frequency.

On February 3, 1989, during the performance of SI 2-SI-4.2.C-4.2, "Functional Test of Unit 2 SRM Rod Blocks/Scrams," it was discovered that the SRM Scram Function was not functional. Since the NI shorting links had been removed, placing the RPS logic for NI scrams in the coincident scram mode, the SRM scram should have been functional. Subsequent licensee investigation revealed that two jumpers had not been removed from the RPS logic earlier that day during performance of SI, 2-SI-4.2.C-3.2, "Functional Test of Unit 2 IRM Rod Blocks/Scrams." The IRM Functional Test requires in steps 7.5.6.1, 7.5.6.2, and 7.5.6.3 that jumpers be placed in the RPS logic if the RPS logic is initially in the coincident scram mode. These jumpers disable the SRM scram function in the same manner as the red NI shorting links.

The IRM functional test is an unusually long procedure with completion in this case spanning two operating shifts. The jumpers were installed by IC technicians during the day shift. The IC technicians responsible for removal of the jumpers were not the same people that had installed them. The jumpers, if installed, are required to be removed in steps 7.14.6.1 and 7.14.6.2. The IC technicians on the evening shift assumed that the jumpers were not installed and annotated N/A on the signature lines for the two steps without referring to the previous steps to verify that the jumpers had not been installed.

The NRC staff recognize that there are several contributing factors to this failure to follow procedures. First, the lengthy procedures required completion by two different crews of IC technicians. However, in this case the problems would have been prevented by proper turnover between shifts. Second, the placement and removal of these jumpers was recently added to the procedure by a ITC. This apparently was the first time that the evening shift technicians had used this version of the procedure. In the IC technicians' previous experience with this procedure, these jumpers had not been installed resulting in their invalid assumption that no jumpers were installed. Again, this would have been prevented through a proper turnover.

The SRM scram function is not a required safety function in the present plant condition, i.e., core fully loaded with no refueling activities in progress, and did not constitute a serious degradation to the ability to shutdown the reactor or mitigate the consequences of an accident. However, the licensee's failure to adhere to procedure directly resulted in an uncontrolled temporary alteration, i.e., jumper being present in a safety-related system while not under the control of an approved procedure or program. This uncontrolled condition lasted approximately two hours. This constitutes a violation (260/89-08-01) of TS section 6.8.1.1.C, which requires that written surveillance and testing procedures be established, implemented and maintained covering SIs.

During this reporting period, the licensee informed the NRC inspector that SI 2-SI-4.9.A.2.a-2, Weekly Check For Shutdown Boards C & D Batteries, was not performed on February 15, 1989 as required. This SI checks on a weekly basis the condition of the 250 volt DC control power batteries for both shutdown boards. The NRC inspector reviewed the completed SI dated February 21, 1989 and observed that the SI was completed satisfactorily. The weekly surveillance not performed on the batteries resulted in the two shutdown boards being technically inoperable from February 15, 1989 to February 21, 1989. Various components were also technically inoperable which receive their electrical power from the shutdown boards including secondary containment. The Unit 1 and 2 diesel generator A was in an outage and consequently, the onsite electrical power to SGBT system Train A was not available which made this train technically inoperable. However, with the Shutdown Board D technically inoperable, the onsite power to SGBT System Train B was also not available and this in turn made Train B technically inoperable. With only one Train of SGBT available, i.e., Train C, Secondary Containment was technically inoperable. As a result of this missed SI, secondary containment was technically inoperable while the licensee moved fuel and performed work over the spent fuel pool on February 18 and 19, 1989.

This is a violation of TS 4.9.A.2.a, which requires that weekly surveillance measurements be performed for the DC power system (259, 260/89-08-02), "Failure To Perform Surveillance On Shutdown Board Batteries."

Two violations were identified in the Surveillance Observation area.

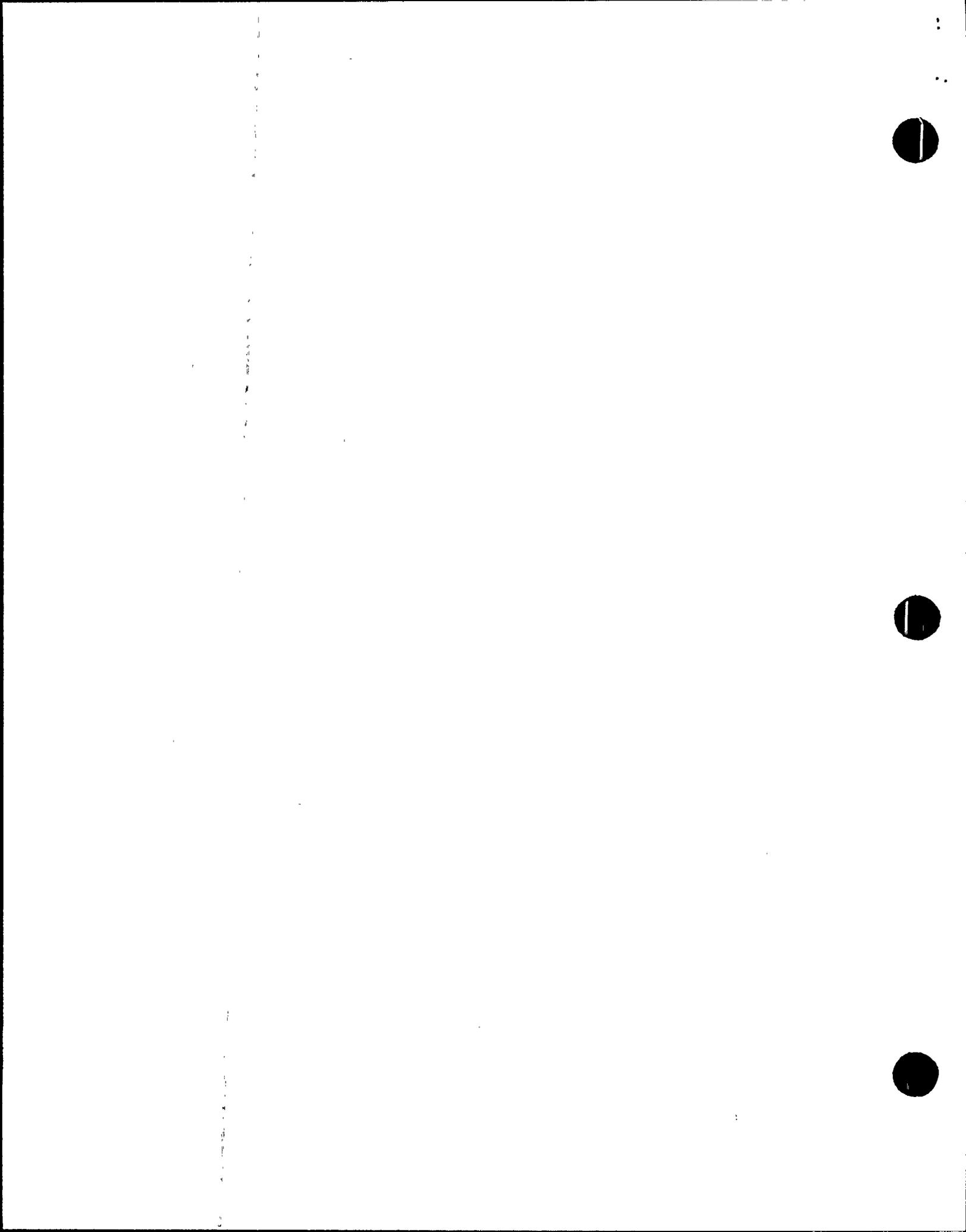
3. Maintenance Observation (62703)

Plant maintenance activities of selected safety-related systems and components were observed/reviewed to ascertain that they were conducted in accordance with requirements. The following items were considered during this review: the limiting conditions for operations were met; activities were accomplished using approved procedures; functional testing and/or calibrations were performed prior to returning components or system to service; quality control records were maintained; activities were accomplished by qualified personnel; parts and materials used were properly certified; proper tagout clearance procedures were adhered to; TS adherence; and radiological controls were implemented as required.

Maintenance requests were reviewed to determine status of outstanding jobs and to assure that priority was assigned to safety-related equipment maintenance which might affect plant safety.

The licensee has divided the plant systems into three divisions with electrical, mechanical and instrument equipments assigned to each division as follows:

Div I	Unit 1/2 DGs A and B; 4160 volt Shutdown Boards A and B; 480 volt Shutdown Boards 1A and 2A; 480 volt Reactor MOV
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Boards 1A, 2A, 1D and 2D; RHR and Core Spray Pumps 1A, 2A, 1C and 2C; SBTG A and CREVs A.

Div II Unit 1/2 DGs C and D; 4160 volt Shutdown Boards C and D; 480 volt Shutdown Boards 1B and 2B; 480 volt Reactor MOV Boards 1B, 2B, 1C and 2D; RHR and Core Spray Pumps 1B, 2B, 1D and 2D and SBTG B.

Div III Unit 3 DGs; Unit 3 4160 volt Shutdown Boards; 480 volt Shutdown Boards 3A and 3B; 480 volt Reactor MOV Board 3A, 3B, 3C, 3D and 3E; SBTG C and CREVs B.

The licensee commenced a Division I outage on February 20, 1989. The NRC inspectors monitored the activities associated with this outage on a continuous basis.

The licensee conducted additional daily meetings other than the daily "War Room" meetings for senior managers, involving coordination of activities as well as "go do" activities. At 6:30 a.m., and at 2:30 p.m., an outage meeting was conducted in which first line supervisors from operations, quality surveillance, maintenance, health physics, DNE and outage management met to discuss real time progress on the individual line items worked in the last sixteen hour period. These discussions appeared to provide the necessary information on the day to day outage activities to keep senior management adequately informed. After the outage meeting, various individuals attended the operations shift turnover meetings held at 7:00 a.m., 3:00 p.m., and 11:00 p.m. This methodology appears to keep all levels of operations department personnel informed of the total daily plant wide activities and appeared to contribute to good communications between all plant as well as site organizations directly involved in the divisional outages.

During this reporting period, the licensee performed the annual and triannual inspection of the unit 3D diesel generator. This DG outage was mainly governed by SI BF SI-4.9.A.1.d, "Diesel Generator Annual Inspection"; and Mechanical Maintenance Instruction MMI-6, "Scheduled Maintenance of the Standby Diesel Generators." Additional SI and Maintenance Instructions were performed as follows: MMI-178, "Maintenance of V-Bolt Drives"; EPI-3-086-MOT004, "Electrical Preventive Instruction Inspection of the DC Backup Air Compressor B Motor for Diesel Generator 3D"; MCI-0-082-CLR001, "Standby Diesel Engine Water Coolers Disassembly, Inspection, Rework, and Reassembly"; EPI-3-082-DGZ004, "Electrical Preventive Instruction Generator 3D Redundant Start Test"; and 3-SI-4.9.A.1.a(3D), "Diesel Generator 3D Monthly Operability Test". The NRC inspectors noted that the BF SI-4.9.A.1.c surveillance governed the annual inspection and the MMI-6 procedure, Section D, governed the three year inspection. The inspector reviewed the above procedures and noted the following: the three year activity involved replacing such items as the temperature control valve, lube oil circulating pump, crankcase pressure detector, fuel pump coupling insert and engine lube oil; the annual activity involved removing and inspecting solenoids in the air



start system; removing, inspecting, and lubricating the air start motors; change various filters; clean the lube oil strainer box and strainer; and inspecting various diesel generator components. This activity required that the facility be placed in a seven day LCO, consequently the activity was scheduled to start at 4:00 a.m. on February 8, 1989 and to be completed at 12:00 p.m., February 14, 1989. The licensee did meet this schedule. The NRC inspectors, on a periodic basis, observed the following activities: replacement of the temperature control valve; testing of various time delay relays; change out of the engine lube oil; redundant air start test of the DG; eddy current testing of the DG cooler; plugging of the three defective tubes in the cooler discovered by the eddy current testing; and various activities involving component cleaning and inspecting. The NRC inspectors observed that the various groups, i.e., mechanical maintenance, electrical maintenance, quality control inspectors, etc., appeared to work as a team with no perceived difficulties in getting the outage activities completed. The day to day monitoring by plant management appeared to be well coordinated with various groups providing input. However, due to cold weather, replacing the oil from 55 gallon drums took longer than expected resulting in the only significant delay that could have had an effect on the "3D" D/G outage schedule.

No violations or deviations were identified in the maintenance observation area.

4. Operational Safety Verification (71707)

The NRC inspectors were kept informed of the overall plant status and any significant safety matters related to plant operations. Daily discussions were held with plant management and various members of the plant operating staff.

The inspectors made routine visits to the control rooms. Inspection observations included instrument readings, setpoints and recordings; status of operating systems; status and alignments of emergency standby systems; onsite and offsite emergency power sources available for automatic operation; purpose of temporary tags on equipment controls and switches; annunciator alarm status; adherence to procedures; adherence to limiting conditions for operations; nuclear instrument operability; temporary alterations in effect; daily journals and logs; stack monitor recorder traces; and control room manning. This inspection activity also included numerous informal discussions with operators and supervisors.

General plant tours were conducted. Portions of the turbine buildings, each reactor building, and general plant areas were visited. Observations included valve positions and system alignment; snubber and hanger conditions; containment isolation alignments; instrument readings; housekeeping; proper power supply and breaker alignments; radiation area controls; tag controls on equipment; work activities in progress; and radiation protection controls. Informal discussions were held with selected plant personnel in their functional areas during these tours.

On February 10, 1989, the licensee reported an incident involving loss of water level from the Unit 1, number one Condensate Storage Tank (CST). Further investigation by the licensee and followup by the NRC inspectors indicated that from approximately 4:00 a.m. to 7:30 a.m., on February 9, 1989, the tank level dropped from 26.7 feet to 10.1 feet and remained there until approximately 8:00 p.m., the same day. This was originally thought to be an instrumentation problem due to cold weather or other problems with the level indication system, not an actual water level loss. However, the licensee concluded that the loss of water was actual and occurred due to overflow from a head tank located on the reactor building roof, which is filled by the condensate transfer pumps which are actuated by the level switches. The licensee has determined that the sensing lines for these switches may have been frozen resulting in continuous operation of the condensate transfer pumps. Approximately two hundred thousand gallons of water were apparently pumped up to the head tank and into the reactor building roof drain system which is not monitored. The NRC inspectors reviewed the control room log sheets from OSIL-66 from February 1 to February 11, 1989 and noted that the Unit 1 CST level fluctuated from approximately 20 feet to 28 feet with the exception of the February 9, 1989 log sheet. The readings on this date indicated that at 0400, the level was 26.7 feet and at 0800, the level was 10.1 feet. The notes on this log sheet indicate that MR 896212 was initiated on 1-LI-2-169, which is the level indicator for the Unit 1 CST. The activity of the remaining water in the CST was analyzed by the licensee. The licensee's review of the documentation on the water in the CST was analyzed. This review of the documentation on the water activity prior to the release was performed and indicated that 10 CFR 20 limits on radioactive releases were not exceeded. This failure to respond to a known indication is being documented as an Unresolved Item (URI 259, 260/89-08-03), "Loss of Approximately 200,000 Gallons From the Condensate Storage Tank."

The NRC inspectors observed the licensee's visual inspection activities of three fuel assemblies on February 18, 1989. Fuel assemblies Nos. LY4673, LY4610, and LJE065 located at core locations 41-14, 13-24, and 59-20 were removed from the core and visually inspected and video taped. The licensee noted a line of what appeared to be pitting and scaling on the channels located approximately 3/4 of the way from the bottom of each assembly. The licensee evaluated this observation and determined that this was not excessive corrosion and would be expected of assemblies that had undergone at least one operating cycle. No problems were noted that had the potential for interfering with the assemblies in the core. All fuel assemblies were returned to the core on February 19, 1989.

No violations or deviations were identified in the Operational Safety Verification area.



5. Restart Test Program (99030B)

The inspector maintained cognizance of ongoing restart test activities, and monitored particular activities in detail as appropriate. Specific inspection observations are discussed in paragraph 5.b below.

a. RTP Program Status

The following information summarizes the status of procedures performed, and the hardware related test exceptions identified by the RTP group, at the time of the inspection. Total test procedures written and approved for performance was 43. Total procedures completed and approved by the plant manager was 32. Total Test Exceptions (TE) identified as of February 28, 1989 involving hardware issues was 211. Of this amount, 187 were resolved and 24 remained outstanding.

b. Specific Restart Test Observations

The NRC inspector reviewed the activities involved in Test Exception 026 of 2-BFN-RTP-024, Raw Cooling Water System. This TE was generated as a result of a failure to meet flow requirements of Step 5.7.3.13, "Recirc MG set 2B Motor Cooler Flow Verification Test", and was later expanded to include sub steps 3, 4, 9, & 10 of step 5.7.3. These additional steps in the procedure were flow verification tests for alternator exciter coolers 2A and 2B, bus duct heat exchanger, electro hydro control oil coolers and reactor feed pump turbine oil coolers. The NRC inspector noted that the TE consisted of 93 pages and appeared to adequately cover the test requirements for these items of equipment.

No violations or deviations were identified in the Restart Test Program area.

6. Site Management and Organization (36301, 36800, 40700)

On February 10, an NRC inspector attended the PORC meeting where the safety evaluation and interim operating criteria associated with the non-seismic vitrified clay piping were presented for review and approval. The licensee had completed a safety evaluation for interim operation with the proposed compensatory measures established to provide an EECW flowpath through the affected components in the event flow was lost due to a seismic event.

In the special requirements section of the safety evaluation the licensee required several steps to be performed in addition to O-AOI-100-5, "Earthquake Abnormal Operating Instruction." These compensatory measures as originally presented to PORC were required to be performed within 6 hours from the time that air temperature in the Control Room reached 95 degrees F. The NRC inspector noted that one of the PORC members properly identified the fact that the safety evaluation was based on the assumption that all three lines would fail concurrently when in fact only a single line might fail. This resulted in an additional requirement to monitor

temperatures in all potentially affected areas. Additionally, PORC required that, since the safety evaluation was only valid under the present plant status, i.e., cold shutdown, it was to be so stated. The PORC meeting was conducted in an effective manner and this problem received the proper amount of management attention by this onsite review committee.

The NRC inspector was informed by licensee management that a long term corrective action plan for the vitrified clay piping issue would be developed to support Unit 2 restart. Revision 3 to O-AOI-100-5 was issued later that day to include these additional interim operating requirements.

The licensee also discussed the cable separation issue and the NRC inspector noted that the original CAQR written to document this issue was to be superseded by additional CAQRs. The purpose for the actions was to adequately document specific separation issues such as non safety-related cables crossing over between different divisions, cables in wrong trays, control cables sharing the same trays with the power cables, and cables starting in one division and ending in another.

The NRC inspectors attended and observed meetings of Browns Ferry TVA Managers from operations, maintenance, technical support and onsite DNE in what is referred to as the "War Room." The topics of discussion involved the inputs from the various groups into the planning and scheduling of system outages, the day to day workings of the "War Room" and frank discussions of items and their priority as well as scheduling impact. The various planning and scheduling groups participated in the meeting by providing their individual reports. A free flowing exchange of ideas, information and questions then took place with each group present being asked by the Browns Ferry Plant Manager to participate. Numerous items were discussed as a result of the various topics and comments made by the participants. Additional "War Room" committee meetings will be held on a daily basis, and the NRC inspectors will attend periodically.

7. Exit Interview (30703)

The inspection scope and findings were summarized on February 28, 1989 with those persons indicated in paragraph 1 above. The inspectors described the areas inspected and discussed in detail the inspection findings listed below. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection. Dissenting comments were not received from the licensee.

<u>Item</u>	<u>Description</u>
260/89-08-01	Violation, Failure To Follow a Surveillance Procedure By Not Removing A Jumper Installed During An IRM Surveillance (Paragraph 2).
259, 260/89-08-02	Violation, Failure To Perform Weekly On Shutdown Board Batteries (Paragraph 2).



259, 260/89-08-03

Unresolved Item, Loss Of Approximately
200,000 Gallons Of Condensate Water From CST
(Paragraph 4).

8. Acronyms

AUO	Auxiliary Unit Operator
AOI	Abnormal Operating Instruction
BFNP	Browns Ferry Nuclear Power Plant
BFNPP	Browns Ferry Nuclear Performance Plan
CAQR	Condition Adverse to Quality Report
CAR	Corrective Action Report
CREV	Control Room Emergency Ventilation
CS	Core Spray
CSSC	Critical Structures, Systems, and Components
CST	Condensate Storage Tank
DCN	Design Change Notice
DG	Diesel Generator
DBVP	Design Baseline and Verification Program
EA	Engineering Assurance
ECN	Engineering Change Notice
EECW	Emergency Equipment Cooling Water
EGM	Electric Governor Motor
ESF	Engineered Safety Feature
FPC	Fuel Pool Cooling
FSAR	Final Safety Analysis Report
GE	General Electric
HVAC	Heating, Ventilation, & Air Conditioning
IC	Instrumentation Controls
IFI	Inspector Followup Item
IRM	Intermediate Range Monitor
ITC	Immediate Temporary Change
KW	Kilowatt
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LRED	Licensee Reportable Event Determination
LOP/LOCA	Loss of Power/Loss of Coolant Accident
MMI	Mechanical Maintenance Instruction
MOV	Motor Operated Valve
MR	Maintenance Request
NE	Nuclear Engineering Division
NI	Nuclear Instrumentation
NOV	Notice of Violation
NPP	Nuclear Performance Plan
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
OI	Operating Instruction
PMI	Plant Manager Instruction
PMT	Post Maintenance/Modification Test
PORC	Plant Operations Review Committee

QA	Quality Assurance
QC	Quality Control
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RPS	Reactor Protection System
RTP	Restart Test Program
RWCU	Reactor Water Cleanup
SDSP	Site Director Standard Practice
SGTS	Standby Gas Treatment System
SI	Surveillance Instruction
SIL	Service Information Letter
SRO	Senior Reactor Operator
SRM	Source Range Monitor
TACF	Temporary Alteration Change Form
TE	Test Exception
TI	Technical Instruction
TS	Technical Specifications
TVA	Tennessee Valley Authority
VIO	Violation
URI	Unresolved Item
USQD	Unreviewed Safety Question Determination

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