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

Report Nos.: 50-348/87-35 and 50-364/87-35

Licensee: Alabama Power Company
600 North 18th Street
Birmingham, AL 35291-0400

Docket Nos.: 50-348 and 50-364 License Nos.: NPF-2 and NPF-8

Facility Name: Farley 1 and 2

Inspection Conducted: December 2-4, 1987

Inspector: S. Stadler 2/3/88
S. Stadler, Team Leader Date Signed

Accompanying Personnel: P. Moore
T. O'Connor
L. Watson

Approved by: M B Shymlock Feb. 8, 1988
M. Shymlock, Chief Date Signed
Operational Programs Section
Division of Reactor Safety

SUMMARY

Scope: This reactive, unannounced inspection was conducted to assess licensee actions in response to an event which occurred on November 27, 1987, involving a spill inside containment from the residual heat removal (RHR) system.

Results: One violation was identified involving two examples of failure to establish and implement procedures (paragraph 7). No deviations were identified.

REPORT DETAILS

1. Persons Contacted

   Licensee Employees

   *R. Hill, Operations Manager
   *D. Morey, Assistant General Manager - Operations
   *J. Osteaholtz, Supervisor - Safety System Analysis and Engineering
   *W. Shipman, Assistant General Manager - Support
   *J. Thomas, Maintenance Manager
   *L. Williams, Training Manager
   *J. Woodard, General Manager

   Other licensee employees contacted included craftsmen, engineers, technicians, operators, mechanics, and office personnel.

   NRC Resident Inspector

   *B. Miller

   *Attended exit interview on December 4, 1987.

2. Exit Interview

   The inspection scope and findings were summarized on December 4, 1987, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the following inspection findings.

   > (Open) Violation 364/87-35-01. Failure to maintain and implement procedures for the use of "NA", the control of procedure deviations, and the restoration of an RHR train to service. (paragraph 7)
   >
   > (Open) Unresolved Item 348, 364/87-35-02. Control of maintenance and tagging activities. (paragraph 8)

   No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters

   This subject was not addressed in the inspection.

4. Unresolved Items*

   One unresolved item was identified during this inspection concerning control of maintenance and tagging activities (paragraph 8).

*An Unresolved Item is a matter about which more information is required to determine whether it is acceptable or may involve a violation or deviation.

5. Sequence of Events

On November 27, 1987, Unit 2 was starting up in Mode 5, and approaching Mode 4. Reactor coolant system (RCS) conditions were approximately 192°F and 380 psig, with both trains of the RHR in operation. Two maintenance work request (MWRs) requiring stroke-time testing of the "A" train RHR containment sump isolation valves 8811A (outboard) and 8812A (inboard) remained to be completed. At approximately 4:45 a.m. operators were directed to perform these tests utilizing surveillance test procedure (STP) FNP-2-STP-11.6, Residual Heat Removal Inservice Test.

STP-11.6 is normally accomplished quarterly to stroke test a large number of valves within the RHR system. For this particular application, all RHR valves except 8811A and 8812A were "NA'd" as not applicable. Initial condition 3.2 of the procedure required that the train to be tested not be in operation and that the system be aligned per system operating procedure (SOP) FNP-2-SOP 7-0, Residual Heat Removal System. SOP 7-0 required the pump suction isolation valves, 8701A and 8701B, be in the closed position. The Shift Supervisor "NA'd" initial condition 3.2, thus allowing the containment sump valves to be stroke tested with the "A" train of RHR in operation and with isolation valves 8701A and 8710B in the open position. When the operator opened the inboard 8812A for testing, RCS pressure and pressurizer level rapidly decreased. The operator immediately reclosed the valve and noted RCS pressure to be approximately 300 psig. With the valve closed, pressurizer level continued to decrease reaching a minimum level of zero percent on the narrow range hot calibrated indication and approximately three percent on the wide range cold calibrated instrument. In addition, the pressurizer relief tank (PRT) level, pressure, and temperature indicators were rapidly increasing causing control room alarms within about two minutes. PRT pressure increased to 100 psig and then dropped to zero psig indicating the PRT rupture disc had ruptured.

Based on the available indications and the valve evolution that had taken place, the Shift Supervisor diagnosed that the "A" RHR train suction relief valve 8706A lifted and stuck open. The Shift Supervisor directed operators to trip the "A" RHR pump and to close suction isolation valves 8701A and 8701B to isolate the RCS leakage. The Shift Supervisor noted an increased waste processing sump level of approximately 1.5 feet and directed operators to evacuate personnel from containment.

With the RCS leakage isolated, the Shift Supervisor initiated efforts to restore pressurizer level. The normal charging path was tagged-out for valve maintenance requiring the use of either flow through the boron injection tank (BIT) or the BIT bypass. The BIT is no longer borated above nominal injection water boration levels at the Farley facility. Due to a much lower flow rate and a desire not to cause a low volume control tank (VCT) level, the Shift Supervisor elected to utilize the BIT bypass flowpath. The initial flow through the bypass, however, was still too high resulting in a low VCT level and a subsequent transfer to the refueling water storage tank (RWST). The operators retransferred the suction to the VCT and began restoring pressurizer level. At approximately 18 percent on the cold-calibrated instrumentation, the hot-calibrated instruments returned to scale and the pressurizer heaters were reenergized. Normal pressurizer level was restored within approximately 35 minutes into the event.

During this time period, operators attempted to drain the PRT level but were unable to operate the drain valve due to a lack of control power and position light indication. An MWR had been written earlier in the shift due to a loss of control indication lights on the valve. Instrumentation and control (I&C) technicians were directed to expeditiously implement the MWR (bypassing the normal MWR processing and planning route). The I&C technicians replaced a blown control power fuse and the operators were then able to open the valve and drain the PRT.

The Operations staff dispatched operators into containment to verify that the outboard containment sump valve, 8811A, had not been partially opened or had leaked by. There were no indications of water in the area of the containment sump indicating that 8811A was fully closed. The licensee also directed personnel to walk down the "A" RHR system to ensure that a suspected pressure surge had not resulted in damage to components, instrumentation, pipe hangers, etc. Upon completion of the system walkdown, the licensee concluded that no damage had occurred. Independent walkdowns of portions of the system by an NRC inspector also confirmed these conclusions.

6. Event Analysis

The licensee's initial report on this event indicated that when the containment sump valve was stroke tested with the "A" RHR train in operation, a void downstream of the valve may have initiated a pressure surge. The pressure surge may have then caused the "A" train suction relief valve to lift and stick open, allowing RCS water to discharge to the PRT. The initial report also indicated that the rupture of the PRT rupture disc resulted in approximately 5000 gallons of water being discharged to the containment floor sump. The amount of water discharged through the rupture disc was later determined to be approximately 2200 gallons.

The inspection team arrived on site on December 2, 1987. The initial licensee briefing indicated that subsequent evaluations supported the conclusions conveyed in the initial notification report to the NRC. The incident investigation was being conducted by the Operations staff. The "A" RHR suction relief valve had been removed for analysis and replaced by an operable relief valve from stock.

After the initial briefing, the inspectors and members of the licensee's Operations and Training staffs attempted to reproduce this event on the simulator. As anticipated, the simulator modeling would not allow duplication of opening the containment sump valve with a resultant pressure surge and relief valve opening. The simulator instructors were able, however, to simulate the stuck open relief valve with RCS conditions of approximately 192° F and 380 psig. With the relief valve open, the RCS pressure and pressurizer level began decreasing. Within approximately 60 seconds, the pressurizer heaters tripped on low pressurizer level. RCS pressure also decreased but at a significantly slower rate than observed during the actual event. RCS pressure after approximately 2 minutes was 360 psig versus 300 psig during the event. Pressurizer level and pressure also began decreasing but also at a slower rate. Attainment of 100 psig in the PRT and subsequent rupture of the PRT disc did not occur for approximately 10 minutes into the simulation.

The simulator instructors subsequently simulated both the "A" and "B" suction relief valves in the open positions. The rate of pressurizer level decrease, RCS pressure decrease, and PRT level and pressure increase under these conditions more closely resembled the actual plant transient. At the request of the inspectors, the instructors also simulated partial opening of the outboard containment sump isolation valve, 8811A, and then opening of the 8812A valve. This evaluation was utilized to determine if a leaking 8811A valve in conjunction with the 8812A valve open could have initiated this event. This scenario did not result in any resemblance to the transient that was observed during this event.

Operations personnel interviewed indicated several possible causes for the suspected pressure surge and initial lifting of the RHR suction relief valve. All of these theories centered around a suspected void between the containment sump isolation valves 8811A and 8812A. The most popular theory appeared to be that when 8812A was opened, the void between the valves was compressed resulting in a decrease in the RHR pump suction pressure. Upon maximum compression of the void, a pressure surge resulted which propogated through the system causing the relief valve to lift. There are still several circumstances, however, which discredit this theory. The "A" suction relief valve had recently passed a bench test lifting at the required 450 psig Technical Specification setpoint and reinstalled. Subsequent to this event, this relief valve was again removed and bench tested, lifting at the required 450 psig setpoint. It was noted, however, that initial attempts at bench testing were unsuccessful due to the valves failure to properly reseat. A review of the RCS pressure strip chart during the event period indicated that the RCS pressure never exceeded approximately 400 psig, 50 psig less than the relief valve setpoint. Operators also indicated that they never received the "Solid RCS Pressure Hi" alarm. The setpoint for this alarm is 440 psig. In addition, the distance between valve 8812A and the suction relief valve is extensive with many elbows and elevation changes in between which would have significantly dampened a pressure surge sensed by the relief valve.

Several Operations personnel interviewed also expressed the theory that the decreas n the RHR pump suction pressure due to the suspected void resulted in flashing of the fluid and lifting of the relief valve. With the RCS temperature at 192°F and RCS pressure 330 psig, the RCS pressure would had to have decreased substantially for flashing to occur. In addition, the operators did not observe any indication of pump cavitation. The third scenario indicated by plant personnel was that the void resulted in train "A" of RHR decreasing to approximately 50 psig less than train "B". The higher pressure in the "B" train pump discharge then slammed shut the check valve on the discharge of the "A" RHR pump. The "A" and "B" RHR trains are cross connected through valves 8887A and 8887B. With the check valve closed, the "A" minimum flow valve FCV-602A would open putting discharge pressure back to the suctions of the pump and lifting the relief valve. This minimum flow line, however, is designed to ensure pump flow, and the functioning of FCV-602A in the past has not resulted in the relief valve lifting. This minimum flow line is also equipped with an orifice which should reduce pressure going back to the suction of the pump and prevent relief valve operation.

In an effort to determine the source of the suspected void, the inspectors noted that a local leak rate test (LLRT) had been performed between valves 8811A and 8812A on November 16, 1987. The clearance (87-1514-2) and test package associated with this LLRT directed technicians to:

- allow operators to drain areas between valves 8811A and 8812A

- pressurize between the two valves to 49 psig with nitrogen and conduct the LLRT,

- vent off the nitrogen, and

- close vents and drains and return control to Operations.

The clearance and test package did not contain directions to fill and vent the six foot eight inch section of 14 inch pipe between the two isolation valves after the test. Interviews with Operations and test personnel and a review of logs and records indicated that the area between valves 8811A and 8812A was never filled with water and vented prior to the November 27, 1987 event. The licensee's investigation concurred with this determination. The failure to fill and vent this area between the two valves established a void in the pipe, and appears to have been the major contributing cause to the event.

This large void also had the potential to cause damage to, and a loss of, the RHR system during a LOCA event. During a large break LOCA the containment sump would fill with water up to the outboard containment isolation valve, 8811A. When automatic transfer to the containment sump suction on low RWST level occurs, this void would then be introduced into the suction of the RHR system. The effects of such a void under these conditions should be evaluated for potential damage to the system due to water hammer, relief valve lift and failure, and vortexing and cavitation of the RHR pump. IE Information Notice 87-10, Potential for Water Hammer During Restart of RHR Pumps, warned Boiling Water Reactor (BWR) facilities of the potential water hammer damage on restart of RHR systems. The source of the water hammer was the draining of portions of the RHR lines while shutdown resulting in voids and severe water hammer upon system restart. NRC Analysis and Evaluation of Operational Data (AEOD) Engineering Evaluation E309, April 1983, also addressed this problem at BWR facilities. Water hammer damage in a PWR secondary system was addressed in NUREG-1190 and Generic Letter 86-07 which discussed the San Onofre Unit 1 November 21, 1985 event. Due to these safety concerns, the licensee is encouraged to enlist the assistance of their plant or corporate engineering staffs in the analysis of this event and to ensure adequate short and long-term corrective actions.

7. Administrative Control

The licensee's failure to establish adequate administrative controls, or to implement existing procedural controls, appeared to have contributed significantly to this event. In addition, the control of post-maintenance testing including scheduling, return to service, and the interface between Operations and Engineering/Planning appeared to be deficient.

During the Unit 2 refueling outage, maintenance work was completed on the outboard containment sump isolation valve 8811A. Additionally, containment sump isolation valve 8812A Limitorque motor operator was opened to replace non-environmently qualified jumper wires under clearance 87-1204-2. The instructions to stroke-time test valve 8812A were written in Section 48, Test and Restoration, of the clearance. The instructions required verification of valve stroke time per continuation sheet 4 of 5 and FNP-2-STP-11.6, Residual Heat Removal Valves Inservice Test.

The licensee's administrative procedure FNP-0-AP-52, Equipment Status Control and Maintenance Authorization, Section 6.1, indicates that the planning and scheduling group will be responsible for scheduling maintenance activities. "Planners will provide job sequence planning which will include: applicable prints, technical manuals, and procedures; proper plant conditions including any necessary pre-testing and clearances; identification of Limiting Conditions for Operation and/or radiation work permits if applicable; parts needed and parts available; testing necessary for functional acceptance; and restoration." This procedure did not appear to be fully implemented for the stroke-time testing of valves 8811A and 8812A in that the clearance did not establish the conditions necessary for testing including the requirement that the RHR "A" train be out of service with the suction valves closed.

Section 3.1.2 of administrative procedure FNP-0-AP-5, Surveillance Program Administrative Control, indicates that the Planning Supervisor is responsible for scheduling all surveillance testing. The clearance also did not establish a testing schedule such as a specific date and time or operational mode. As a result, the stroke-time testing was not completed until November 27, seven days after the work on valves 8811A and 8812A was completed.

By the time that the Shift Supervisor noted these uncompleted test requests, Unit 2 was approaching Mode 4 with the RCS at approximately 192°F and 380 psig and both trains of RHR in service. At this point, compliance with initial condition 3.2 of STP-11.6 would have required the shifting of cooling loads from the "A" to the "B" train, shutting down the "A" train, and closing the "A" RHR pump suction isolation valves. The Shift Supervisor reviewed the RHR drawing and since the valve to be stroke-tested was not in the main flowpath, determined that it was not necessary to comply with initial condition 3.2 of STP-11.6. Although a licensed operator questioned the advisability of performing the valve tests with the "A" train in operation, the Shift Supervisor elected to "NA" initial condition 3.2 in a manner similar to the "NA" utilized for all the unnecessary individual steps in STP-11.6.

Administrative procedure FNP-0-AP-1, Development, Review and Approval of Plant Procedures, Surveillance Program Administrative Control Section 3.4.7, defines initial conditions as "independent actions which shall be completed and plant conditions which shall exist prior to procedure use." Additionally, FNP-0-AP-5, Section 7.2, requires that surveillance procedures will include conditions that must exist prior to a test including initial conditions. Neither of these procedures, or other existing licensee procedures, addressed the use of "NA" entries in system operating or surveillance procedures, and particularly the use of "NA" to omit procedure system initial conditions.

The only procedural guidance and controls that appeared to be established over the use of "NAs" in procedures appeared to be in the unit operating procedures (UOPs) such as UOP-1.1, Startup of Unit From Cold Shutdown to Hot Standby. Due to the many plant conditions that can exist on a startup, these procedures allow the Shift Supervisor to "NA" non-applicable initial conditions. Unit operating procedures are generally considered guidelines at most facilities and do not require verbatim compliance as do operating and surveillance procedures.

Clearly, if only one section of a surveillance procedure is utilized, as it was in STP-11.6, the rest of the steps which are not utilized need to be marked not applicable as well as any <u>step</u> specific precautions, limitations, or initial conditions for steps not performed. An example would be initial condition 3.3 of STP-11.6 which is applicable only to encapsulated valves. Since valve 8812A is not encapsulated, this particular initial condition would not be applicable.

This lack of administrative controls over the use of "NA" in surveillance and operating procedures was also exhibited in several other areas associated with this event. The procedure steps not utilized in STP-11.6 were "NA'd" without initials to document the author, and the data page contained "NAs" without initials and with curved arrows down through various steps to be "NA'd". In addition, licensed reactor operators and senior operators interviewed felt that operators could "NA" procedures, while Operations management indicated only Shift Supervisors had this perogative.

In the absence of defined procedural guidance on the use of "NAs", the Shift Supervisor evaluated the test to be accomplished and determined that the RHR system being in operation would not present a problem. Had, in fact, the void not been in existence between valves 8811A and 8812A and the subsequent suction relief valve had not failed, the testing of the valves with the "A" RHR train in service may not have caused a problem.

There are three significant concerns with this deviation from an initial condition of an approved procedure. First, the Shift Supervisor was not aware of the basis for this particular initial condition requirement. The licensee indicated that the basis for initial condition 3.2 of STP-11.6 was not for concern of potential voiding and resultant pressure surge or water hammer damage. The requirement for the system to be shutdown during stroke-time testing was, according to the licensee, to prevent discharging RCS coolant to the containment sump should the outboard isolation valve leak while testing the inboard valve. The containment sump is normally dry during non-LOCA conditions. Since it would be very difficult for a Shift Supervisor or operator to be cognizant of the basis behind all procedural precautions, limitations and initial conditions, departure from these requirements should receive adequate review to ensure that the deviation would not potentially degrade the operability of the system or validity of the surveillance test.

The second concern is that the licensee's approved procedures, in place at the time of this event, did not appear to permit this deviation. FNP-0-AP-6, Procedure Adherence, Section 3.0, requires adherence to all plant procedures except under emergency conditions or a temporary procedure change as allowed by FNP-0-AP-1, Development, Review and Approval of Plant Procedures. FNP-0-AP-1 and Technical Specification 6.5.3.1 allow temporary changes to procedures which clearly do not change the intent of the procedure. These temporary changes must be approved by two members of the plant staff, at least one of whom holds an SRO license. FNP-0-AP-16, Conduct of Operations, Section 5.5, defines a temporary procedure change as applicable to a system not performing in a manner covered by existing procedures or in such a manner that portions of existing procedures do not apply. FNP-0-AP-16 also requires that plant procedures shall be adhered to in the conduct of all plant operations except where adherence to the procedures will create an undue hazard to personnel, equipment, or public health and safety. FNP-0-AP-57, Preservice and Inservice Inspections, Section 4.12, requires Operations to perform inservice testing in accordance with plant procedures. FNP-0-AP-5, Surveillance Program Administrative Control, Section 3.2.4, requires that each group will ensure that test procedures are performed as written. In the deviation from initial condition 3.2 of STP-11.6 on November 27, 1987, a plant emergency did not exist, and the deviation was not processed as a temporary procedure change. The licensee indicated that they believed that even if the deviation had been treated as a temporary change, the required second approval would have probably been obtained and the results would have remained the same. This conclusion is difficult to ascertain after the fact, but the reactor operator did question the decision at the time, and an SRO licensed staff member on shift during the event indicated that he would have been reluctant to approve the "NA" of an initial condition.

The failure to provide adequate administrative controls over the use of "NA" in approved procedures, and the failure to comply with existing administrative controls in deviating from an approved procedure, is a violation (364/87-35-01).

The third concern associated with the utilization of STP-11.6 for stroke testing valves 8811A and 8812A is that step 5.1.5 does not stipulate the sequence in which the two valves should be cycled, or for fill and vent following testing. Due to the piping configuration, it appears that cycling of the 8811A and 8812A valves, regardless of sequence could lead to the establishment of a void. With 8812A and 8811A closed, this void would be trapped until the automatic transfer of RHR from the RWST to the containment sump under LOCA conditions. Therefore, upon completion of the valve testing, filling and venting may be required to eliminate the possibility of a void and the potential for water hammer and system damage. Operators interviewed indicated that the only reason they elected to test 8812A before 8811A was that 8812A required local visual verification (non-encapsulated) and an operator was already in the area. The licensee should review this procedure to determine whether a sequence should be specified, or whether post-testing fill and vent is required following stroke testing of these valves.

As addressed in paragraph 6 of this inspection report, one of the primary contributing causes of this event appears to be an air void trapped in approximately 7 feet of piping between valves 8811A and 8812A. Due to work on these containment isolation valves during the Unit 2 outage, a local leak rate test (LLRT) was required under the licensee's inservice valve testing program. The leak rate test was performed by the test group under clearance 87-1514-2 on November 16, 1987. The continuation sheet associated with this clearance directed operators to drain the section of piping between the valves. The technicians were then directed to pressurize the area to 49 psig with nitrogen, perform the LLRT, vent off the nitrogen, and turn the system back to Operations for functional restoration. FNP-0-AP-52, Section 6.1 requires planners to provide directions for functional acceptance testing and for restoration to service. FNP-0-AP-5, Section 7.2.8, requires that instructions be provided for returning equipment and systems tested to a normal operating status. Instructions for the return to service of the portion of the RHR "A" train system between valves 8811A and 8812A were not provided on

November 16, 1987, and the clearance did not reference an approved procedure for this purpose. The system was turned over to Operations for restoration to service and Operations failed to ensure the area between the valves was properly filled and vented.

As previously addressed there is also a potential that this trapped void could have resulted in a loss of the RHR "A" train during LOCA conditions either due to water hammer damage or due to a stuck-open suction relief valve. The failure to provide adequate procedural guidance for the restoration of the "A" RHR train to service and to ensure fill and vent is an example of violation (328/87-35-01).

This event highlights a need for the licensee to increase their management controls over post-maintenance and surveillance testing and to improve the interface between the testing group, the work planners, and Operations. Existing procedures require the planners to provide applicable permits, procedures, proper plant conditions, Limiting Conditions for Operation (LCOs), functional acceptance testing, and directions for restoration to service. In actual practice, the licensee generally prefers to turn the system or equipment over to Operations following test completion. Operations then determines the method of system restoration. In addition, the licensee utilizes a surveillance procedure covering the entire system to perform post-maintenance testing on a small portion of the system (in this case two valves) versus writing a specific post-maintenance test procedure or instruction. This methodology requires Operations to "NA" numerous other steps within the surveillance procedure, a practice, which in this case, was extended to a procedure initial condition.

The scheduling of post-maintenance testing also appears to require improvement. In this particular case the work on valves 8811A and 8812A was completed on November 20 while the plant was still in an outage. Since the clearance did not specify a date, time or plant mode for the stroke-time testing, the testing did not occur until November 27 with the plant approaching Mode 4 operation. With all the activities required to support plant start-up and both trains of RHR already in operation, this lack of specific scheduling appears to have contributed to the decision to test the valves with the "A" train in operation.

8. Control of Maintenance and Tagging Evolutions

In May 1986, inspectors conducted a reactive inspection to review the circumstances surrounding a wrong unit/wrong train tagging error involving the RHR system (Inspection Report 348, 364/86-10). As part of this inspection, the inspectors reviewed the licensee's incident reports (potential reportable events) for 1985 and 1986. This review noted approximately 33 personnel errors associated with maintenance activities including tagging and wrong train/wrong equipment errors. The licensee subsequently determined that 18 of these errors were significant enough to require additional corrective actions such as additional training, required reading, and procedure changes. The inspection report identified two causes which appeared to contribute to the apparent continuing level of similar personnel errors:

- Inadequate specific directions on the maintenance work requests, and

- Each event appeared to be treated as an isolated event without adequate trending of similar events and errors or programmatic corrective actions.

The cover letter associated with the escalated enforcement for the RHR wrong unit/wrong train event requested the licensee's response to describe the particular actions for improving performance in this area. The licensee's response, in addition to event specific corrective actions such as color coding and labeling of unit access doors, indicated that:

- each incident involving personnel error would be investigated individually.

- corrective actions would be taken for each case as required.

- corrective actions would include counseling or retraining of appropriate individuals and revision of appropriate procedures.

As part of this inspection of the RHR event of November 27, 1987, the inspectors briefly reviewed recent event reports in the area of maintenance and tagging personnel errors. Although the scope of this review was significantly less than that conducted by inspectors in 1986, the following similar personnel errors were noted:

a. On November 9, 1987, while working on a system relief valve for the Unit 2 "A" train RHR pump, the "B" train relief valve drains were inadvertently opened by a maintenance journeyman resulting in a discharge of water.

b. On November 9, 1987, two maintenance personnel disassembled the Unit 2 "A" train seal injection return filter outlet valve instead of the "B" train valve. The wrong valve was disassembled even through three protective red tags were attached to the valve to prevent manipulation.

c. On November 27, 1987, during replacement of the Unit 2 "A" train RHR suction relief valve, as a result of the relief valve failure earlier on November 27, PRT level was inadvertently raised by operators resulting in a discharge of 400 gallons of water to containment.

d. On October 20, 1987, during recovery from MOVATS testing on Unit 2 valve LCV-115D (charging system), a second tag on breaker FV-T5 was removed without adequate review of the MWR and system status resulting in a discharge of water from open vents.

e. On October 20, 1987, while attempting to restart Unit 1 charging pump 1B following electrical maintenance, the pump amps were zero and no flow was indicated. Operators opened the breaker door and observed that the power cables were disconnected even though electrical maintenance had presented the equipment to the Shift Supervisor for test. This event is nearly identical to one discussed in Inspection Report 348, 364/86-10 where electricians signed the MWR request as complete before reconnecting cables, and the maintenance electrical foreman signed the work complete without adequate verification of the work being completed.

f. On October 13, 1987, electrical maintenance disconnected the Unit 1 "B" train post accident hydrogen recombiner, while the "A" train recombiner was tagged out resulting in both trains being inoperable and entry into Technical Specification 3.0.3. In this event the licensee indicated that the approved drawings were in error.

g. On September 3, 1986, the Unit 2C diesel generator air dryer outlet valve was found tagged in the wrong position (open vs closed). The journeyman mechanic had operated the red-tagged valve in violation of procedures and left the valve open.

The licensee appeared to perform well in the investigation and documentation of plant events. Consequently, the licensee believes that this makes them more vulnerable to criticism in this area. The inspectors have continuing concerns, however, that most of these events and errors appear to be preventable; that the corrective actions may be too limited in scope. In addition, the licensee does not appear to have increased their trending capability for tracking personnel errors or repetitive failures to allow assessment of the need for programmatic corrective actions.

Many of these personnel errors involve non-licensed maintenance personnel removing the wrong equipment for work or operating red-tagged valves or breakers. In addition to the personnel hazards associated with these type of errors such as pressurized fluids, steam, electricity, and increased exposure or contamination, a number of the events in 1985, 1986, and 1987, involved the removal from service of safety-related equipment such as redundant RHR trains. This safety-related equipment should be under the strict control of licensed operators to ensure continued operability. This is particularly important where one train is already out of service for maintenance or repair and an error could result in a loss of both trains. Pending further inspection and review of the licensee's performance and corrective actions in this area, the management control of maintenance and tagging activities is identified as an unresolved item (348, 364/87-35-02).