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February 2, 1991

Director, Office of Enforcement
U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
Reply to a Notice of Violation
San Onofre Nuclear Generating Station, Units 2 and 3

Reference: Letter from Mr. John B. Martin (USNRC) to
Harold B. Ray (SCE), dated January 4, 1991

The referenced letter forwarded a Notice of Violation and Proposed Imposition of Civil Penalty resulting from the special NRC inspection conducted between October 1 and November 15, 1990, at the San Onofre Nuclear Generating Station, Units 2 and 3. This inspection report addressed two Technical Specification violations, resulting from misaligned valves, which were identified by SCE and discussed in NRC Inspection Report Nos. 50-361/90-37 and 50-362/90-37.

In accordance with 10 CFR 2.201, the enclosure to this letter provides the Southern California Edison (SCE) reply to the Notice of Violation. SCE's payment for $150,000, the amount of the proposed civil penalty, will be paid effective February 4, 1991 through the wire payment process.

If you have any questions regarding SCEs response to the Notice of Violation or require additional information, please call me.

Sincerely,

Harold B. Ray

Enclosure

cc: J. B. Martin, Regional Administrator, NRC Region V
C. W. Caldwell, NRC Senior Resident Inspector, San Onofre

ENCLOSURE

Reply to a Notice of Violation

The enclosure to Mr. Martin's letter dated January 4, 1991 states in part:

"A. Technical Specification (TS) 3.7.1.2, 'Auxiliary Feedwater System,' requires that at least three independent steam generator auxiliary feedwater pumps and associated flow paths shall be operable in Modes 1, 2 and 3. The Action statement for this TS requires that with one auxiliary feedwater pump inoperable, the auxiliary feedwater pump shall be made operable within 72 hours or the reactor shall be placed in Hot Standby within the next 6 hours and in Hot shutdown in the following 6 hours.

"Section 1.17 of the TS states that 'a...component or device shall be OPERABLE...when it is capable of performing its specified function(s) and when all necessary attendant instrumentation, controls...or other auxiliary equipment that are required for the...component or device to perform its function(s) are also capable of performing their related support function(s).'

"Contrary to the above, a steam trap on a steam line to the turbine which drives auxiliary feedwater pump 2P-140 was isolated from 4:25 a.m. on August 31, 1990 to 2:00 p.m. on October 21, 1990, rendering auxiliary feedwater pump 2P-140 inoperable for Unit 2. The pump was inoperable because isolation of the trap allowed moisture to accumulate in the steam supply line to the turbine, causing the turbine to trip on overspeed when started; therefore, the automatic function of the pump was not available. Table 3.3-5 of the TS shows a response time of 42.7 seconds for actuation of the pump. Also, Section 10.4.9 of the FSAR states that the system automatically supplies feedwater to the steam generators during emergency conditions. The reactor was operated in Mode 1 during the entire period that the trap was isolated.'

"This item has been categorized as a Severity Level III violation (Supplement I), applicable to Unit 2."

RESPONSE TO ITEM A

1. Admission or denial of the violation

Southern California Edison admits the violation.

2. Reason for the violation, if admitted

Reasons for Steam Trap Misalignment

Procedural Deficiency (Refer to Figure 1)

With the unit in cold shutdown, steam trap F-207 isolation valve MU-1257 and steam trap F-209 isolation valve MU-1258 were closed in accordance with procedure SO23-2-18 in order to apply a nitrogen blanket to steam generator E-088. The procedure was deficient in that it failed to include the requirement to reopen MU-1257 and MU-1258, or to direct use of another procedure which would have reopened the valves, when returning the steam generator to service.

Accordingly, the Main Steam System was returned to service and Unit 2 entered Mode 3 with MU-1257 and MU-1258 isolated on August 31, 1990.

Procedure Writer's Guide Deficiency

The failure to include steps in procedure SO23-2-18 to realign all valves for which positions are changed, prior to completing the procedure, and reliance instead on the assumed use of other procedures to achieve this realignment, was not prohibited by the procedure writer's guide.

Reasons for Delay In Identification of Steam Trap Misalignment

Design Error Involving Component Classification

The need to maintain the Turbine Driven Auxiliary Feedwater Pump (TDAFWP) steam lines free from excessive moisture in order to prevent an overspeed trip during automatic starting was recognized by Edison during plant startup testing. Numerous steam traps were replaced with constant flow orifices as a result. The importance of proper functioning of steam trap F-207 in this regard was significantly increased when, in 1987, a change was made to normal system alignment to maintain steam line isolation valve HV-8201 normally closed. At this time, steam trap F-207 should have been classified as safety related since its operation became necessary for reliable TDAFWP operation.

AFWPT STEAM SUPPLY DRAIN SYSTEM

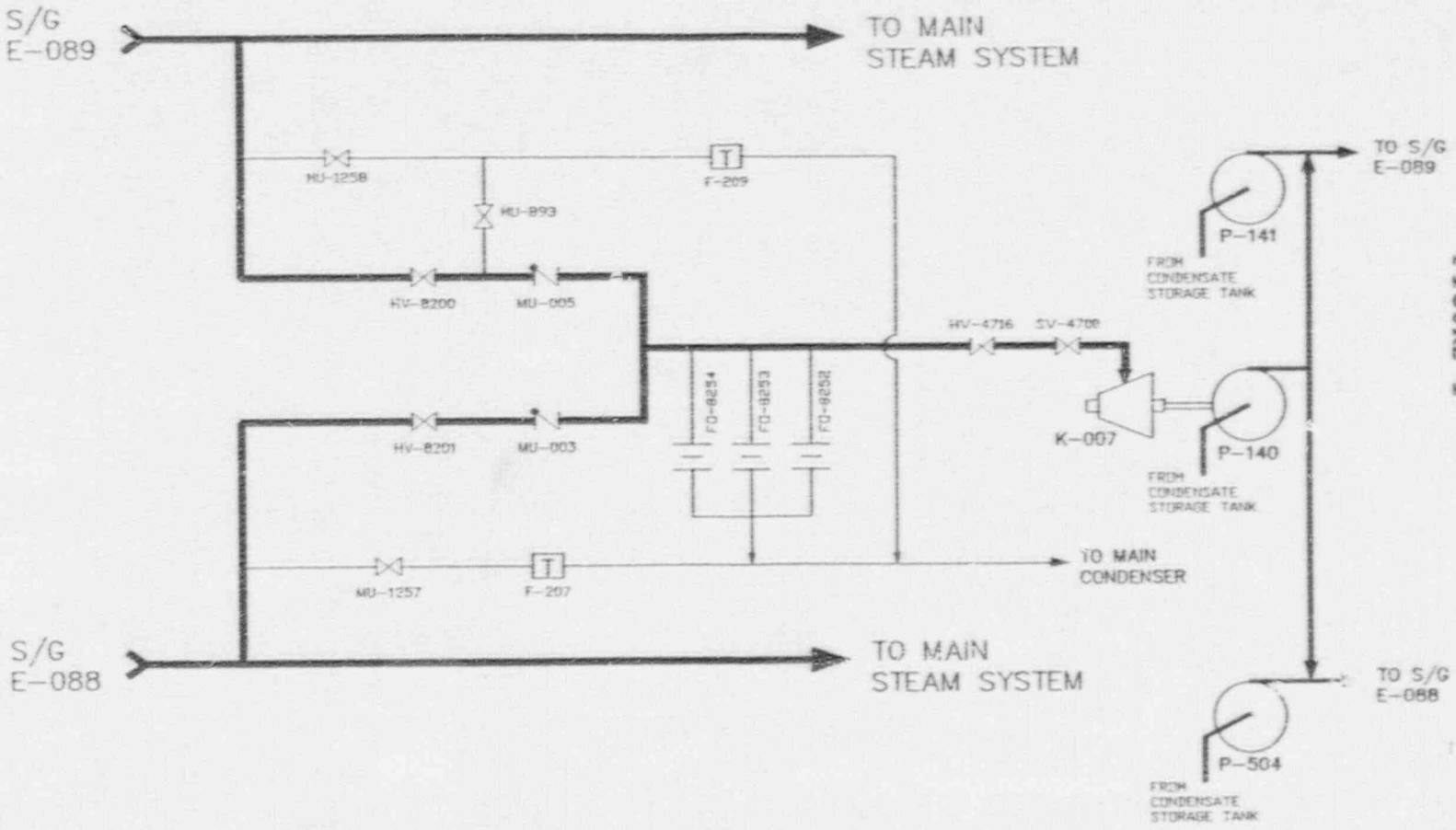

FIGURE 1

Notwithstanding the increased significance of steam trap F-207 to the proper functioning of the TDAFWP, the steam trap F-209 on the second steam line to the TDAFWP, continued to be classified as non-safety related. (The non-safety related classification for steam traps is considered appropriate for applications where proper operation is not important to safety functions. In the case of F-209, the associated steam line isolation valve HV-8200 remains normally open and excessive moisture is discharged by the downstream constant flow orifices mentioned above.)

As a result of the non-safety related classification of the steam traps, operations personnel did not fully recognize the safety significance of the proper alignment of isolation valves MU-1257 and MU-1258. As a result, they were not subjected to regular surveillance, as required for other AFW valves, and identification and correction of the misalignment of MU-1258 on September 26, 1990 did not result in a formal investigation which would have identified that MU-1257 also was misaligned.

Informal and Inadequate Communication Between Groups Involved In Investigation Of TDAFWP Overspeed Trips

The TDAFWP first tripped on overspeed on October 6, 1990, during starting for a stroke test of steam inlet valve HV-4716. Recognizing that moisture in the steam lines was one of several likely causes, Station Technical engineers requested plant operators to verify the steam supply alignment to the turbine as part of the trip investigation. The position of MU-1257 was not checked as part of the verification conducted.

The TDAFWP tripped again on overspeed on October 16, 1990, during starting as part of an accelerated test program established after the October 6, 1990, trip. Station Technical engineers again requested plant operators to verify the steam supply alignment to the turbine. Although several components in the steam supply to the turbine were verified to be in proper alignment, the position of MU-1257 was again not checked.

Subsequent investigation of the results of the prior requests for steam trap alignment verification revealed that they had been made and conducted informally, without the use of checklists and written instructions, and that verification of correct alignment of MU-1257 had been missed. This led to the false assumption during further investigative actions that moisture in the steam supply to the turbine had been eliminated as a potential cause.

When the ongoing accelerated testing again resulted in a TDAFWP overspeed trip on October 21, 1990, and excessive moisture was observed streaming from the turbine exhaust, steam trap isolation valves associated with the steam supply to the turbine were again checked for proper alignment resulting in the discovery that MU-1257 was improperly closed.

Failure to Positively Identify the Cause of the Overspeed Trips Prior to Returning the TDAFWP to Service

As indicated above, investigating personnel believed they had eliminated excessive moisture in the steam supply as an overspeed trip cause. In addition, thermographic inspections were performed to verify proper operation of the orifice drain lines. Consequently, the investigation focused on various possible causes of intermittent TDAFWP governor malfunction.

An extensive program of component investigation and testing was undertaken. Industry and plant experience indicated that oil contamination of the hydraulic governor systems had resulted in overspeed trips of TDAFWPs. This led to identifying turbine governor stability, both hydraulic and electrical, as a possible cause of the overspeed trips.

Following the October 6, 1990 overspeed trip, the turbine governor lube oil and filter were replaced. After conducting overspeed trip tests, governor stability tests, and an inservice pump test, the TDAFWP was successfully started four times. In all cases, the suspect components were determined to be operating properly and the TDAFWP was declared operable.

Following the October 16, 1990 overspeed trip, many of the activities of October 6, 1990 were re-performed including speed tests, governor stability tests, and overspeed trip tests. In addition, potential deficiencies associated with the steam inlet valve (HV-4716) trip linkage, and throttle valve and governor binding were investigated as possible causes and eliminated. Even though suspect components were found to be operating properly, various components including governor components were replaced to correct potential intermittent causes of the overspeed trip. Successful completion of all applicable surveillance procedures appeared to verify that the TDAFWP was operable.

Although investigating personnel believed and reported that the potential causes of the overspeed trips had been

identified and corrected, management did not take appropriate action to validate and confirm both the positive identification of the causes and the positive elimination of other potential causes (e.g., excessive moisture). Considering the critical importance of TDAFWP reliability, this failure to take action was not appropriate.

Failure of Pump Testing Procedures to Correctly Represent TDAFWP Operating Conditions

Following the initial overspeed pump trip on October 6, 1990, a total of 22 tests were performed to verify TDAFWP operability. Overspeed trips were experienced only 3 times during these tests because the pump testing procedures did not fully represent actual operating conditions.

Specifically, the test procedure was deficient in that it did not require the TDAFWP to be started coincident with opening HV-8201, as would be the case in an actual, automatic start. In the absence of procedural direction to start 2P-140 coincident with opening HV-8201, enough time usually elapsed to allow the condensation trapped upstream from HV-8201 to drain through the downstream flow orifices before a start was attempted. As a result, overspeed trips occurred only 3 times out of 22 starts during the period when MU-1257 was isolated, and the cause of the trips was attributed to intermittent problems in the TDAFWP controls.

This procedure deficiency existed despite SCE's actions in response to industry experience and guidance concerning AFW pump testing. The change discussed above to maintain HV-8201 normally closed occurred in 1987, following implementation of SCE's response to INPO SOER 86-1, and the significance of the change to the procedure was not then recognized. Further SCE reviews occurred in 1989 and 1990 in response to additional industry guidance, but again the significance of HV-8201 being normally closed to the conduct of the test was not recognized.

Excessive TDAFWP Governor Sensitivity to Steam Line Moisture

The TDAWFP is capable of automatic starting and reliable operation with substantial entrained moisture in its steam supply if the overspeed trip setpoint is set at approximately 120-125% of normal rated speed. However, the design of the overspeed trip setpoint at SONGS (110% of nominal) requires that less moisture be permitted to accumulate in the steam lines. This renders the pump sensitive to overspeed tripping as a result of associated steam line moisture.

3. Corrective steps that have been taken and the results achieved.

Correction of Moisture Accumulation

Upon discovery of the condition on October 21, MU-1257 was promptly opened returning steam trap F-207 to service. Condensation in the piping associated with F-207 was drained.

A complete alignment verification of the main steam lines was performed in accordance with SO123-0-23, and no other valves were found misaligned.

Proper operation of the 2P-140 steam supply drain system traps was verified using thermographic inspection.

Procedural Corrective Action

The Steam Generator (SG) nitrogen blanketing procedure SO23-2-18 was revised to ensure that all valves are repositioned to their normal position when returning the steam generator to service.

Appropriate procedures that align systems for shutdown activities, such as nitrogen blanketing, were reviewed to ensure that proper restoration alignment requirements are included.

The writer's guide for preparing procedures, SO123-VI-0.9, was revised to ensure adequate controls are contained in procedures to realign valves to their normal positions when returning systems to service.

Operations Division Corrective Action

The importance of periodically checking the status of the 2P-140 steam supply drain system was stressed to the operators. In addition, the shiftily TS surveillance procedure SO23-3-3.25 and the monthly TS surveillance procedure SO23-3-3.16 were revised to require a check of the 2P-140 steam supply drain system. Associated with this action, the steam trap isolation valves were evaluated for inclusion in the locked valve program. Since locking them does not ensure proper operation of the steam trap, and since the checks required by the shiftly TS surveillance ensures the trap is functioning properly, it was determined that the valves should not be locked open.

This event was reviewed with appropriate Operations personnel, emphasizing the need for thorough investigations and operability assessments of affected components when a valve misalignment is identified. The procedure SO123-0-23 governing the discovery of a valve misalignment was modified to ensure an operability assessment of affected components is performed.

In addition, a memorandum was issued and reviewed by all Operations personnel reiterating the importance of using good problem solving techniques as described in the Operation's Professional Operator Development program. The memorandum illustrated how use of these techniques would question changes in plant status leading to a more thorough verification of system alignments.

Station Technical Division Corrective Action

This event was reviewed with appropriate Station Technical engineering personnel, emphasizing: 1) the need to formally direct investigatory actions, such as valve alignment verification, to ensure that those actions are effectively communicated and completed; and 2) the need to ensure appropriate compensatory actions are implemented when plant configurations are changed such as when the position of HV-8201 was changed from normally open to normally closed.

4. Corrective steps that will be taken to avoid further violations.

Engineering Evaluations

The TDAFWP steam trap, F-207, will be classified as safety related.

An engineering study will be initiated to determine the feasibility of modifications (e.g., increasing the overspeed trip setpoint) to reduce AFW pump turbine vulnerability to water ingress and is expected to be completed by July 1, 1991. If additional measures are determined to be feasible, modifications will be implemented in the Cycle 7 refueling for each unit.

Increased Management Involvement

Even though a definitive root cause of the 2P-140 overspeed trips was not established, the investigation conducted within the root cause evaluation program concluded that the actions taken (i.e., requested steam trap alignment verification, repair and replacement of governor components

followed by an accelerated testing program) had adequately responded to the problem. An examination of this event has resulted in the conclusion that a more rigorous review, involving higher levels of responsible management, should occur when equipment is returned to service under these circumstances. Accordingly, the Nonconformance Reporting and Root Cause evaluation programs will be enhanced by February 15, 1991, to include augmented management reviews of action taken to restore critical safety equipment to service which have been demonstrated to be operable without having specifically determined the root cause.

5. Date when full compliance will be achieved.

Full compliance was achieved on October 23, 1990, when 2P-140 was started and run satisfactorily after reopening valve MU-1257.

The enclosure to Mr. Martin's letter dated January 4, 1991 also states in part:

"B. Technical Specification (TS) 3.5.2, 'ECCS Subsystems - T-AVG Greater than Or Equal to 350 Degree F,' requires in Modes 1, 2, and 3 that two independent Emergency Core Cooling System (ECCS) subsystems be operable, with each subsystem including one operable high-pressure safety injection (HPSI) pump and one operable low-pressure safety injection (LPSI) pump. Subsection a. of the Action Statement for TS 3.5.2 requires that, with one ECCS subsystem inoperable, the inoperable subsystem shall be restored to operable status within 72 hours or the Unit shall be placed in Hot Standby within the next 6 hours and in Hot Shutdown in the following 6 hours.

"TS 3.6.2.1, 'Containment Depressurization and Cooling System,' requires that two independent containment spray systems shall be operable in Modes 1, 2 and 3 with each spray system capable of taking suction from the refueling water storage tank (RWST) on a Containment Spray Actuation Signal. The Action Statement for TS 3.6.2.1 requires that with one containment spray system inoperable, the inoperable spray system shall be restored to operable status within 72 hours or the Unit shall be placed in Hot Standby within the next 6 hours.

"TS 3.6.1.1, 'Containment Integrity,' requires that primary containment integrity be maintained in Modes 1, 2, 3, and 4. The Action statement for TS 3.6.1.1 requires that without primary containment integrity, containment integrity shall be restored within one hour or the Unit shall be in at least Hot standby within the next 6 hours and in Cold Shutdown

within the following 30 hours.

"Contrary to the above, with Unit 3 operating in Mode 1, containment emergency sump outlet valve 3HV-9302 was open from 10:52 a.m. on September 24, 1990 to 9:00 a.m. on September 28, 1990, which rendered Train B HPSI, LPSI, and containment spray subsystems inoperable for lack of net positive suction head and resulted in containment integrity not being maintained by the creation of a flow path out of containment through the refueling water storage tank.

"This item has been categorized as a Severity Level III violation (Supplement I), applicable to Unit 3."

RESPONSE TO ITEM B

1. Admission or denial of the violation.

Southern California Edison admits violation.

2. Reason for the violation, if admitted.

Reasons for Valve Misalignment

Inadequate Work Control

On September 24, 1990, installation of new color-coded labels associated with a Unit 3 ESF auxiliary relay cabinet was reviewed in a meeting between the worker, the Shift Superintendent (SS) and later that day with the Control Room Operator (CRO).

The full scope of the work was not discussed by the worker at the meetings with the SS and CRO, and a walkdown was not conducted to completely understand the details of the activity. The SS did caution the worker that in case of an inadvertent circuit breaker operation in the cabinet, he should not reset any breakers and should notify the control room. No additional requirements or directions were given to ensure close control over the activity.

Because of the inadequate work controls, consideration was not given to either: 1) providing supervision appropriate for the work, or 2) deferring the work consistent with management policy to minimize the potential for a plant trip or transient.

operators did not effectively conduct normal status board indication reviews either during the shift or at shift turnovers.

Ineffective Use of the Plant Monitoring System Information

The PMS alarm system is heavily burdened with information not required to monitor plant status. For example, numerous alarm setpoints are set close to normal operating values causing continuous alarms, or causing conditions to alarm which are part of normal plant evolutions. In addition, alarms associated with PMS performance (software alarms) are displayed to the operators. Because these nuisance alarms are the majority of those presented by the PMS and are not useful to the operators, the PMS was not an effective plant monitoring tool.

3. **Corrective steps that have been taken and the results achieved.**

Correction of Valve Misalignment

On September 28, 1990, the misalignment of HV-9302 was discovered and the valve was promptly closed from the Control Room.

Operations Division Corrective Action

The procedure for on-shift equipment status monitoring was modified to add a shiftly review or verification of the following: 1) PMS alarms (hard copy), 2) CFMS alarm pages, 3) Control Room Status Displays, 4) alignment of valve positions on Control Room control boards are checked against their position indicating labels with any discrepancies understood, and 5) all annunciators in alarm are understood.

SCE's program for controlling the work on systems and components which may have the potential for causing a plant transient while at power was modified. The program now requires a second level of control, such as a checker or supervisor, for all work activity on ESF cabinets and other locations with similar potential for causing a plant transient.

This event was reviewed as a lesson-learned with operations personnel. The need to completely understand the scope of proposed work and consider the potential risks was emphasized.

The individuals involved in this event have received appropriate disciplinary action.

Pending issuance of a TS change to include surveillance requirements for the containment emergency sump valves, administrative controls are being implemented. Specifically, the administrative controls will require that with either the inside or outside CES isolation valves open, or any of the safety injection mini-flow valves closed, TS 3.5.2 or TS 3.5.3, "ECCS Subsystems - $T_{avg} \geq 350$ F, and $T_{avg} <$ 350 F" as appropriate, will be entered for inoperability of that ECCS subsystem. With more than one CES isolation valve open in Modes 1 through 4, TS 3.6.1.1, will be entered.

Verification of the containment emergency sump outlet valve positions has been incorporated into the routine shift surveillances.

Verification of the ECCS and CS mini-flow valve positions has been incorporated into the routine shift surveillances.

Design Engineering Corrective Action

A design change has been implemented in accordance with 10 CFR 50.59 to maintain the inside containment emergency sump valves HV-9304 and HV-9305 normally closed. This change maximizes containment reliability and has the concurrence of the NSSS supplier.

SCE completed a systems review which determined a remote potential existed for a single electrical failure that would result in the simultaneous opening of both the inside and outside containment emergency sump isolation valves. This potential single failure was eliminated for Units 2 and 3 with the implementation of a design change.

Other Correction Action

Although efforts to optimize PMS performance continue, several changes to the Plant Monitoring System have been effected to provide operators with improved plant status information. Specifically, the number and frequency of nuisance alarms and the number of alarms associated with PMS performance (software alarms) has been reduced.

The event was also reviewed with cognizant personnel in the Station Technical and Maintenance Divisions as a part of our lessons learned program.

4. **Corrective steps that will be taken to avoid further violations.**

Station management has accelerated completion of a review of the administrative work assigned to operators. This review will be completed by July 1, 1991. As a result of this effort additional time will become available to the operators for normal plant monitoring and problem solving.

An engineering evaluation will be performed by September 30, 1991, to identify other critical ECCS and CS valves not having audible annunciation of misalignment whose initial position is critical to component or system operability. Appropriate corrective action will be implemented based on the results of this engineering study.

A TS change to incorporate appropriate surveillance requirements for the CES isolation valves, and for ECCS and CS pump mini-flow valves will be submitted by July 1, 1991.

An audible alarm and an annunciator window will be provided in cycle 8 to annunciate open CES isolation valves and closed ECCS and CS pump mini-flow valves. As an interim corrective action, a computer alarm will be provided by the end of February, 1991, to alert operators of a CES isolation valve misalignment.

5. **Date when full compliance will be achieved.**

Full compliance was achieved on September 28, 1990 when HV-9302 was restored to the closed position.

Worker Failure to Follow Direction

While removing a label in the relay cabinet, the worker accidently moved a circuit breaker slide switch partially in the open direction. The movement of the switch was sufficient to de-energize portions of the Recirculation Actuation Signal (RAS) circuitry causing HV-9302 to open. Contrary to the direction he had been given by the SS, the worker did not leave it as-is and failed to adequately communicate the switch movement to control room personnel.

Failure to Fully Investigate Status

After moving the circuit breaker slide switch, the worker asked the CRO to check the status of the ESF relay cabinet to ensure it was correct since he may have bumped a circuit breaker. The operators failed to conduct a complete investigation. Two licensed operators promptly checked the status indications in the ESF auxiliary relay cabinet verifying all were normal and proper. The operators did not pursue the possibility of ESF component actuation; nor was additional available status information used to verify there was no inadvertent component actuation. For example, they did not check the main control room panel valve position control which indicated the isolation valve was open or two other passive sources of plant status information, the Plant Monitoring System (PMS) and Critical Functions Monitoring System (CFMS) which indicated the valve had repositioned. The operators also failed to notify the Control Room Supervisor of the workers report.

Reasons for Delay In Identification of Valve Misalignment

Failure to Properly Classify Valve

Mispositioning of this valve renders one ESF train inoperable and violated containment integrity. On this basis, it should have been provided the same status, alarm, and surveillance requirements as other status-changeable components in the system. This includes shiftly and other periodic checks.

Insufficient Emphasis on Routine Surveillance of Control Panel Status Indications

Clear direction emphasizing the priority of plant monitoring was not continuously stressed by management. Additional administrative duties and workload distractions caused a change in priorities with more time devoted to supporting activities not associated with plant monitoring. Procedural guidance was not adequate to ensure the emphasis on plant monitoring remained a priority. As a result,