ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-361/95-16
50-362/95-16

Licenses: NPF-10
NPF-15

Licensee: Southern California Edison Co.
P.O. Box 128
San Clemente, California

Facility Name: San Onofre Nuclear Generating Station, Units 2 and 3

Inspection At: San Onofre, San Clemente, California

Inspection Conducted: July 16 through August 26, 1995

Inspectors: J. A. Sloan, Senior Resident Inspector
J. J. Russell, Resident Inspector
D. L. Solorio, Resident Inspector

Approved: W. D. Johnson for
F. R. Huey, Acting Chief, Project Branch F

9/22/95
Date

Inspection Summary

Areas Inspected (Units 2 and 3): Routine, announced resident inspection of operational safety verification, maintenance and surveillance observations, engineering and plant support observations, followup on corrective actions for violations, other followup, and followup of licensee event reports.

Results (Units 2 and 3):

Operations

- Operator attentiveness and communications continue to require improvement as evidenced by: an abnormal flickering lumigraph on a control room panel which the control operator had not noticed (Section 2.1); Unit 2 operators who were surprised to discover that a room cooler makeup valve had been cleared (Section 2.2); and operators who inadvertently energized a containment purge fan, causing containment pressure to decrease until a Technical Specification Limiting Condition for Operation Action Statement had to be entered (Section 2.5).

- Poor operator performance contributed to licensee-identified problems which were treated as a noncited violation. Specifically, operators increased flow through a low pressure safety injection pump beyond what was allowed for the system configuration, resulting in cavitation of the pump (Section 2.3), and a plant equipment operator partially closed a valve in the wrong train of component cooling water (Section 2.4).

- The first reactor coolant system drain to midloop during the Unit 3 Cycle 8 refueling outage (Section 2.6), and the Unit 3 core reload (Section 2.8) were generally well controlled.

Maintenance

- A significant weakness was noted in the control of maintenance work during the Unit 3 outage. In particular, numerous discrepancies were noted associated with the performance of procedure verification activities, e.g., failure to perform required verification signoffs, and improper verification signoffs involving work that had not been done or work that had not been done in accordance with procedure requirements (Sections 3.1.2, 3.1.3, and 3.1.4).

- Two other minor maintenance problems were noted: a technician lost control of a lead which came in contact with a power supply, disabling all Unit 3 radiation monitor annunciators for approximately 1 hour (Section 2.7); and foreign material exclusion controls were poorly implemented, resulting in confusion as to what controls were in effect in the area of the Unit 3 pressurizer (Section 3.2).

- A noncited violation was identified by the inspector involving a fire pump battery surveillance procedural step which was not performed as directed, potentially resulting in invalid battery data (Section 4.1).

Engineering

- Good engineering performance was noted involving investigation and resolution of two significant plant problems: (1) failure of a WKM gate valve (Section 5.2.2); and (2) anomalous reactor coolant Pump 3P002 vibration, caused by failing seal cooler baffle bolts (Section 5.2.3). However, the inspectors also noted that both of these problems had been identified in the past, and failure to fully correct them the first time represented missed opportunities to prevent repetitive equipment failures.

- A noncited violation was identified when affected procedures were not revised to reflect two plant design modifications (Section 5.1).

Plant Support

- Performance in the plant support functional area was good. Minor weaknesses identified by the inspectors included one incident of inappropriate materials in the radiological controlled area (Section 6.1.1), poor conditions around the sample sink in the chemistry laboratory (Section 6.1.2), and a visitor control problem (Section 6.2.1).

Summary of Inspection Findings:

- Unresolved Item 361/9516-01; 362/9516-01 was opened to review several examples of improper control of maintenance procedure verification requirements (Sections 3.1.2, 3.1.3 and 3.1.4).

- Unresolved Item 361/9504-02; 362/9504-02 was closed (Section 7.1).

- Violation 361/9504-03 was changed to a noncited violation and closed (Section 7.2).

- Licensee Event Reports 361/95-013, Revision 0; 361/95-012, Revision 0; and 361/95-007, Revision 0, were closed (Sections 8.1 and 9).

- Three noncited violations were identified (Sections 2.4, 4.1, and 5.1).

Attachments:

- Attachment 1 - Persons Contacted and Exit Meeting
- Attachment 2 - Acronyms

DETAILS

1 PLANT STATUS (71707)

1.1 Unit 2

The unit began the inspection period operating at 82 percent power due to performance of a heat treatment of the circulating water system. The unit returned to full power (99 percent) on July 16, 1995, and continued to operate at essentially full power through the end of the inspection period.

1.2 Unit 3

The unit began the inspection period operating at 98 percent power. On July 17, 1995, power was reduced to 96 percent as a result of the first point heater bypass valve being closed. The unit operated at 96 percent power until July 21, 1995, at which time the unit reduced power to 80 percent to perform a heat treatment of the circulating water system. The heat treatment was completed, and the reactor was shutdown at 1:34 a.m. on July 22 to begin the Unit 3 Cycle 8 refueling outage.

Mode 4 was entered at 3:15 a.m. on July 23, 1995, and Mode 5 was entered at 4:05 a.m. on July 24. The unit entered Mode 6 on July 30, and was in Mode 6 until August 22. Core reload began on August 22, 1995, and was in progress at the end of the inspection period.

2 OPERATIONAL SAFETY VERIFICATION (71707)

2.1 Control Room Indicator Awareness

On July 24, 1995, the inspector observed that the bottom bar of the lumigraph indication for Unit 3 Steam Generator (SG) E089 pressure, 3PI1013-3, was flickering, indicating potential failure of the indicator. Since Unit 3 was in Mode 5, and the SGs were at atmospheric pressure, the bottom bar should have been solidly lit. The control operator was unaware of the condition until it was identified by the inspector. The inspector noted that this was the only operable safety-grade indication of SG pressure, since the other three channels had simulated input signals to support calibrations.

The inspector discussed the condition with station technical personnel and determined that the flickering indication was abnormal. The licensee intended to, but had not yet completed, calibrating all control room lumigraphs to keep the bottom two bars lit as an indication that the lumigraph was functioning.

The inspector concluded that the problem was of little significance, due to the existing plant conditions; however, the control operator should have been aware of the abnormal indication. The licensee acknowledged the inspector's comment.

2.2 Operator Awareness of Plant Configuration

On August 1, 1995, Unit 2 operators attempted to add makeup water to the Unit 2 control element drive mechanism control system (CEDMCS) room cooler, but found that a clearance had isolated the makeup. The operators subsequently reported during shift turnover that the condition had caught them by surprise. The inspector reviewed Work Authorization Record (WAR) 3R8CC674, which had cleared the isolation valve. The WAR had been issued to allow a minor design modification for the Unit 3 CEDMCS room cooler valves, but clearly noted that the isolation valve was common to both units. The WAR stated that makeup to Unit 2 would be prevented until the valve work was completed and the clearance boundary moved. The clearance had been hung on July 24, 1995. Because the valve work was expected to take only about 4 days, and makeup was only required every 7 to 10 days, temporary provisions were not made for making up to the Unit 2 CEDMCS room cooler.

The valve work was subsequently completed, and the clearance boundary changed to allow operators to add makeup water in time to avoid impacting unit operation. The inspector determined that the system was not safety-related, and that alternative methods of cooling the CEDMCS room could have easily been developed and implemented. Based on this, the inspector determined that there was no direct safety impact of the CEDMCS room cooler makeup water being isolated.

The inspector concluded that the Unit 2 operators were not appropriately cognizant of the abnormal configuration. Additionally, the work had not been monitored to ensure that it was either completed, or an alternative method implemented, in time to support normal operational needs.

2.3 Cavitation of Low Pressure Safety Injection (LPSI) Pump 3P015 - Unit 3

Shortly after the full core was offloaded to the spent fuel pool, on August 8, 1995, operators ran Unit 3 LPSI Pump 3P015 without sufficient inlet suction pressure, which resulted in cavitation of the pump. Operators had started the LPSI pump to perform a surveillance in accordance with Attachment 2, "Safety Injection RCS Loop Check Valve and Low Pressure Safety Injection Header Check Valve Tests," of Procedure SO23-3-3.31.2, Issue 2, Temporary Change Notice (TCN) 0-1, "ECCS Valve Testing - Cold Shutdown and Refueling Interval."

This surveillance procedure required operators to increase shutdown cooling (SDC) flow to 5000 gpm to test flow through several check valves. Shortly after operators increased flow to approximately 5000 gpm, the pump suction pressure and flow decreased dramatically while the motor current oscillated. Operators quickly recognized that the pump was cavitating and that it was caused by operation of SDC with a 10-inch suction line. Operators then reduced flow to stop the transient condition. Normal operation of the SDC system used a 16-inch line, which would have satisfactorily supported the 5000 gpm flow test.

The inspector reviewed Procedure SO23-3-3.31.2 and noted that it contained no precautions for limiting SDC flow when aligned to the 10-inch suction line, only providing overall guidance to limit maximum flow to 5320 gpm. The inspector also noted that the procedure required operators to review SDC system operation Procedure SO23-3-2.6, TCN 8-3, "Shutdown Cooling System Operation," for any applicable limitations. The inspector determined that operators had reviewed the procedure and concluded that Attachment 17, "Shutdown Cooling System Limitations and Specifics," was sufficient to provide guidance on all applicable limitations for the flow test. However, the attachment did not specifically address flow limitations when aligned to the 10-inch suction line. The inspector reviewed the procedure and noted that Section 6.8, "SDCS Operation With Mispositioned SDCS Return/LTOP Valves," was applicable when the 10-inch line was in service. Specifically, Section 6.8 referred operators to Attachment 14, "SDCS Operation Requirements With Mispositioned SDCS Return/LTOP Valves," which then referred operators to Attachment 7, "SDCS Return Line Bypass Operation Curve." This attachment contained a flow limit of 4500 gpm for the 10-inch suction line. In addition, the inspector determined that when the 10-inch suction line was placed in service several days earlier, operators had reviewed Attachment 7 and noted the flow limitations; however, this information was not communicated to subsequent crews as part of the turnover process.

In response to this occurrence, the licensee implemented several corrective actions. The first and most immediate was to hang a caution tag on the applicable control board, warning operators of flow limitations while the 10-inch suction line was in service. The licensee also provided preshift briefs to all crews regarding this event. The long-term actions, which were not implemented as of the end of this inspection period, will be addressed in an Operations division evaluation report. Preliminarily, Operations management stated that changes would be made to Operations procedures to provide for improved control of flow limitations when aligned to the 10-inch suction line. In addition, Operations management considered that the information to limit flow should have been communicated as part of shift turnover and stated that training would be provided to operating crews to reenforce this expectation. The inspector considered that the licensee's completed and proposed corrective actions were adequate.

The inspector concluded that two operational weaknesses led to this event. The first and the most significant was failure of control room operators to fully recognize that plant status (i.e., operation of SDC aligned to the 10-inch suction line) required implementation of guidance in Section 6.8 of Procedure SO23-3-2.6. The second weakness involved inadequate or overly cumbersome plant operating procedures. The surveillance procedure did not provide guidance to operators regarding flow limitations when aligned to the 10-inch suction line. In addition, the SDC system operating procedure was not organized to facilitate clear understanding of significant system operating restrictions. The inspector concluded that the resultant safety significance of this event was low because the SDC system was not required for core cooling (the core had been previously offloaded to the spent fuel pool).

2.4 Clearance of the Wrong Train of Component Cooling Water (CCW) Equipment - Unit 3

On August 10, 1995, a plant equipment operator (PEO) in the process of implementing a work authorization modification (WAM) to WAR 3-R8TB001 operated a wrong train component. Specifically, the WAM required closing Valve 3HCV6514 (the Train B CCW heat exchanger inlet isolation valve), which had previously been cleared by WAR 3-R8TB001. However, the PEO attempted to close Train A CCW heat exchanger outlet isolation valve (3HCV6214). Shortly after stroking Valve 3HVC6214 in the closed direction, the PEO heard flow-induced noises and recognized that, since the line was supposed to be drained, there should have been no flow. The PEO quickly returned the valve to full open and immediately contacted the control room to communicate the error in valve operation.

The plant conditions at the time were such that Train A was the only available CCW train, and the reactor was defueled. The major heat load at the time was the Unit 3 spent fuel pool, which contained the fully-offloaded core. The licensee stated that the valve operation error resulted in a short term decrease in CCW flow of approximately 1000 gpm. The inspector determined that, within a few seconds of operation of Valve 3HVC6214, operators received low flow alarms and quickly contacted the PEO and requested an investigation into the cause of the decrease in flow.

As a result of this event, the licensee initiated several corrective actions, including a preshift briefing of the event for all operating crews, and appropriate disciplinary action. The inspector concluded that the licensee's corrective actions were adequate.

The inspector reviewed the WAM and the WAR, interviewed involved operators, and concluded that, although licensee administrative controls appeared satisfactory, the performance of the involved PEO was not adequate. The inspector determined that several barriers were bypassed that could have precluded the event. The first involved inadequate self-checking by the PEO. Since the PEO carried the WAM to the WAR into the field (which described that 3HCV6514 was supposed to be closed and not 3HCV6214), it appeared that greater attention-to-detail could have precluded the event. Another bypassed barrier involved failure to implement good operating practices for contacting the control room prior to performing the first valve manipulation of an evolution. The inspector also concluded that the resultant safety significance of this event was low because the decrease in CCW flow was momentary and did not significantly affect loads being cooled by the CCW system. However, the inspector emphasized to licensee management that the PEO's failure to manipulate the correct CCW valve, as directed by the WAM, had the potential for greater significance under more critical circumstances.

The inspector concluded that the failure to properly implement procedures for this event and the event described in Section 2.3 was a violation. Since the violation was identified and corrected by the licensee, it is being treated as a noncited violation, consistent with Section IV of the NRC Enforcement Policy.

2.5 Unintentional Containment Pressure Limiting Condition of Operation Entry

The licensee informed the inspector that on June 17, 1995, Unit 3 operators unintentionally established, for approximately 1 hour, a slightly negative pressure in containment, in excess of Technical Specifications (TS) limits. The inspector reviewed computer data points, the procedure in effect, the licensee's Division Investigation Report (DIR) 3-95-19, and logs and indications available to operators. The licensee determined that the design differential pressure for containment was not exceeded, and concluded that the root cause of the negative pressure was unanticipated fan operation following improper operator recovery actions from a previous spurious containment purge isolation signal. Licensee corrective actions included counseling the involved operator who had failed to properly secure a minipurge supply, additional clarification of involved procedures, and assignment of mandatory reading for all operators concerning the incident.

2.6 Draindown to Midloop - Unit 3

On July 28, 1995, the inspector observed Unit 3 operators preparing for RCS draindown to midloop conditions. The inspector noted that prior to the draindown, licensee craft were installing tags on the heated junction thermocouple connections at the top of the vessel head. The physical agitation caused two thermocouples in Train B to fault, which later disabled Train B. The inspector was concerned that, if minor physical agitation could disrupt these couplings, they could also be disrupted in a loss of coolant accident, disabling vessel level indication when it was most needed. In response to the concern, the licensee cleaned the two thermocouple connections, planned to have computer technicians perform reinstallation (as opposed to using refueling technicians), and installed covers on the connections when they were not connected. The inspector considered the licensee's actions to be adequate, as keeping the connections clean and having well-trained individuals make the connections should alleviate problems with physical agitation causing the connections to open. Train B indication was subsequently restored.

The inspector noted that the draindown procedure referred to a prestaged maintenance order (MO) to repair thermocouples if both Train A and B, Level 5 thermocouples faulted prior to commencing the draindown. The inspector noted that an MO, specific for this purpose, had not been prestaged. In response to the inspector's observation, the licensee prepared the MO.

The inspector observed operators drain the reactor coolant system (RCS) to midloop. Midloop was defined as a water level of approximately 26 inches above the bottom of the RCS hot-leg piping. The inspector noted that the draindown was methodical, well controlled, and was conducted in accordance with Procedure SO23-3-1.8, TCN 7-20, "Draining the Reactor Coolant System." The inspector noted that overall operator performance was good.

2.7 Inadvertent Loss of Radiation Monitor Annunciation

The inspector observed operations in the Unit 3 control room on August 23, 1995, and noted that a field change was in progress in the control room outer hallway to move the control modules for the Unit 3 main steam line radiation monitors to positions different from, but near, their current positions in the rack. Core reload was in progress, but core alterations had been temporarily halted, and a containment purge was in progress. While disconnecting wires, the technician performing the field change inadvertently allowed a wire to touch a power supply module. This action shorted the power supply, blew a fuse, and disabled all annunciation for Unit 3 radiation monitoring. Operators manually secured the containment purge and monitored radiation indications locally. Annunciation was restored in approximately 1 hour.

The inspector concluded that operator actions were good, but the technician had not implemented appropriate control for disconnection of wires from the modules. The licensee planned to better protect these leads for upcoming Unit 2 modifications.

2.8 Core Reload - Unit 3

On August 24, 1995, the inspector observed a portion of core reload activities. Based on this observation, the inspector concluded that these activities were well controlled, noting good communications among involved personnel in the control room, at the spent fuel pool, and in containment.

3 PLANT MAINTENANCE (62703)

During this inspection period, the inspector observed and reviewed selected documentation associated with the maintenance and problem investigation activities listed below to verify compliance with regulatory requirements, compliance with administrative and maintenance procedures, required quality assurance/quality control department involvement, proper use of safety tags, proper equipment alignment and use of jumpers, personnel qualifications, and proper retesting.

3.1 Inadequate Procedure Control During Maintenance Work Activities

The inspectors noted several instances of inadequate procedure control during the performance of maintenance work activities. Specific examples included:

3.1.1 Excore Nuclear Instrumentation Replacement

On August 15, 1995, the inspector observed a technician in the Unit 3 containment building connect cables as part of the installation of replacement excore nuclear instrumentation. The inspector observed that the working copy of the work package was not at the work location for Channel C, where the technician was working, but was instead near Channel D, in another area of the containment building. Additionally, the working copy of construction work order (CWO) 94081854000, applicable to Channel C, had not been updated as work

progressed. The technician was working on Step 9, while only Steps 3 through 5 were marked (crossed off) to indicate completion. None of the steps were signed or initialed as having been completed. The technician explained that the official (original) copy of the CWO was outside of containment and was updated when the technicians left containment. The inspector reviewed the CWO and determined that the steps prior to Step 9 had been completed, and that subsequent steps would verify proper system function. The inspector concluded that, although the observed practice did not violate licensee procedures, the failure to more rigorously track completion of work steps in the field appeared to be a poor practice which could contribute to work control problems similar to those described below.

3.1.2 Saltwater Cooling Valve Inspection and Pump Overhaul

On August 16, 1995, the inspector observed work and reviewed the associated MOs and procedures for one ongoing and one completed maintenance activity in the Unit 2 and Unit 3 salt water cooling (SWC) pump rooms.

One maintenance activity involved removal and inspection of the discharge butterfly valve for SWC Pump 3P307, Valve 3HV6202. The controlling MO was 94061278, and the procedure being implemented was Procedure SO23-I-6.240, Revision 1, "Fisher Model 7600 Series Butterfly Valves Overhaul and Model 486U Piston Actuators Overhaul." The inspector reviewed the paperwork and noted that by August 14, the valve had been removed from the system, placed on a stand, and inspected. However, the inspector observed that procedure Steps 3.4 (to verify prerequisites were met prior to commencing work) and 6.5.2 (to matchmark the valve and associated piping prior to valve removal) were not signed in the procedure as being completed. A note was attached to the procedure to have night shift sign these steps. The inspector, on August 16, 1995, inspected the valve and pipe for match marks and found none.

The second job involved replacement of the discharge check valve for SWC Pump 3P113. The controlling MO was 95080476, and the procedure being implemented was Procedure SO23-I-6.20, Revision 2, "TRW and Techno Corporation Twin Flapper Check Valve Overhaul." The inspector noted that the work had been completed, and a rebuilt valve had been installed. However, on August 16, 1995, procedure Steps 6.3.23 (torquing the stud bolts that held the valve in place to half the final torque value) and 6.3.24 (torquing the same bolts to full torque value) had not been signed as completed. Step 6.3.25 of the procedure was signed as "reassembly complete."

The inspector reviewed Procedure SO123-I-1.3, Revision 4, "Work Activity Guidelines," and noted that programmatically it was permissible to not sign for work completed until the end of the shift or work activity. The inspector questioned the Maintenance manager as to what the end of a work activity meant. The Maintenance manager defined the end of a work activity generally as a natural break in the flow of the work. The inspector concluded that, in the instances noted above, this management expectation had not been met, because the unsigned steps and the unperformed step had been noted after definite breaks in the work activity had occurred.

On August 29, 1995, the inspector noted that Valve 3HV6202 had been reinstalled and matchmarked. The inspector reviewed the completed procedure and noted that Step 6.5.2 was signed as having been completed on August 14, 1995. Since the inspector had observed no matchmark on August 16, the August 14 verification signature did not appear to be accurate. This is an unresolved item pending further review (Unresolved Item 361/9516-01; 362/9516-01).

3.1.3 Reactor Coolant Pump (RCP) Overhaul

The inspector reviewed aspects of work associated with RCP Motor 3MM003, performed in August 1995, in accordance with maintenance Procedure SO23-I-8.231, Revision 3, "Reactor Coolant Pump Motor Bearing Inspection and In Place Maintenance," authorized by MO 93020092000.

Based on a review of documentation and interviews with involved licensee personnel, the inspector determined that a licensee machinist had bypassed independent verification signature requirements on three occasions: (1) he jacked up the motor shaft without verification of measurements (Step 6.6.6.6); (2) he jacked up the motor shaft without verification of a calculation (Step 6.6.6.7); and (3) he proceeded with thrust runner heatup without verification of a micrometer setting (Step 6.6.6.11). Each of these steps required independent verification "prior to performing next step."

The inspector also determined that a foreman had signed off verification steps without performing the specific actions required by the procedure on two occasions: (1) he signed off Step 6.6.6.6 without verifying the specified measurements; and (2) he signed off Step 6.6.6.11 without verifying the micrometer setting. Furthermore, the foreman failed to properly document the procedure verification problems which had occurred during the previous shift and failed to inform licensee management of these problems.

The inspector interviewed machinists and foremen associated with this work and determined that the work was controlled as "periodic use" per Maintenance Procedure SO123-I-1.3, Revision 4, "Work Activity Guidelines." This procedure allowed flexibility in who could sign completed work steps. However, the procedure did not allow personnel to sign steps as noted above, since they had neither performed nor had first-hand knowledge of proper completion of the required activities. Additionally, the machinist stated that he thought that flexibility allowed in the sequencing of steps extended to verification steps, even though the verifications were explicitly specified as being required prior to performance of the next step.

The inspector also noted that data from the calculation in Step 6.6.6.6 of the "working copy" of Procedure SO23-I-8.231 was not accurately transferred to the "official copy." The working copy was maintained at the job location, so that data and progress could be documented concurrent with the actual work. The licensee's practice was to have personnel (at the end of the shift) update the official copy in the general foreman's office, based on either memory or facsimiles of the working copy. For this procedure, the licensee also

replaced pages from the working copy with pages from the official copy, thus losing the original documentation. The working copy indicated a measurement of 21 3/16 inches at the 270° position, while the official copy indicated the measurement was 21 1/4 inches. While the differences in data noted above did not appreciably change the result of the calculation, the inspector could not determine the basis for the change. Additionally, the inspector noted that the failure to verify the correct transfer of data, in conjunction with the loss of the original data, could result in improper assembly of the motor.

The inspector concluded that control of the work did not conform to procedural requirements. This issue is an unresolved item, pending evaluation of other similar work control deficiencies noted during this inspection period (Unresolved Item 361/9516-01; 362/9516-01).

3.1.4 Emergency Diesel Generator (EDG) 3G002 Inspection

On August 6, 1995, the inspector reviewed Maintenance Procedure S023-I-8.68, TCN 0-9, "Emergency Diesel Generator and Components Check," for work in progress on EDG 3G002, 20-cylinder engine, under MO 94062244000. The inspector noted that work had been performed on Steps 6.10.2.6 through 6.10.2.8, but that Step 6.10.2.6 required a verification to be performed and signed prior to performance of the next step. The verification, involving closure of engine coolant drain valves, had not been signed. The inspector questioned the day-shift foreman, who stated that the steps had been performed on the night shift of August 5, 1995. The foreman also stated that he could resolve the discrepancy by doing the verification.

The inspector determined that the valves were closed, and that any improper valve positions would have been detected as a part of postmaintenance testing. The inspector concluded that the verification requirement was prudent but not essential to assuring that the maintenance was properly performed. However, the inspector determined that failing to perform required verifications on safety-significant components, such as the EDG, could in other cases result in improperly performed maintenance going undetected, causing reduced reliability or functionality. This is an unresolved item, pending evaluation of other similar work control deficiencies noted during this inspection period (Unresolved Item 361/9516-01; 362/9516-01).

3.2 Foreign Material Exclusion (FME) Controls

The inspector observed, on August 8, 1995, that some workers did not appear to be cognizant of the FME controls in place over the Unit 3 pressurizer area. One worker stated that he had just been in the area and that no FME controls were in place. Another worker leaving the area indicated that FME controls were in place. The inspector noted that the sign posted at the bottom of the ladder to the area was unclear because it did not define the FME areas, and the inspector notified licensee management of the potential confusion. Although FME controls were in effect in portions of the pressurizer work areas, the licensee determined that no foreign material had been introduced

into the pressurizer, and the licensee reviewed the posting for clarity. The inspector concluded that the licensee's response was adequate.

3.3 Other Maintenance Observations

Other maintenance activities were observed:

Unit 3

- Replace diode brackets in EDG 3G003 Control Cabinet 3L161
- Replace EDG 3G003 air start solenoids
- Incore Instrument thimble plate withdrawal
- Incore Instrument connector inspection
- Procedure SO23-I-8.68 EDG 3G003 overhaul
- Replace SWC pump
- Rig RCP 3P002 motor to 70' containment
- Clean and inspect 480V switchgear 3BRA
- Install SWC Pump MP113

These activities were performed adequately.

4 SURVEILLANCE OBSERVATIONS (61726)

Selected surveillance tests required to be performed by the TS were reviewed on a sampling basis to verify that: (1) the surveillance tests were correctly included on the facility schedule; (2) a technically adequate procedure existed for performance of the surveillance tests; (3) the surveillance tests had been performed at the frequency specified in the TS; and (4) test results satisfied acceptance criteria or were properly dispositioned.

4.1 Diesel Generator-Driven Fire Pump Surveillance - Units 2 and 3

On August 8, 1995, the inspector observed part of a quarterly TS-required battery surveillance for the diesel generator-driven fire water pump. Specifically, the inspector observed an electrician recording the specific gravity of several diesel battery cells. The electrician used Procedure SO23-I-2.19, TCN 6-2, "Batteries - Quarterly Diesel Fire Pump Battery Inspection," to perform the quarterly surveillance. The inspector noted that Step 6.2.2.1 required the electrician to record the ambient temperature using a digital hydrometer (used to measure the specific gravity of the battery cell electrolyte). The electrician measured and recorded the ambient temperature

as 97°F. The electrician proceeded with the surveillance and recorded the specific gravity of the electrolyte samples for the individual battery bank cells. The inspector noted that the temperature of the electrolyte was averaged between 78°F to 82°F for several of the battery cells. Initially, the inspector questioned the appropriateness of the recorded reference temperature, since the ambient temperature did not appear to be over 90°F on the day of the surveillance. The inspector subsequently determined that the procedure, specifically Step 6.2.2.4, required that the electrolyte sample temperature be allowed to equalize to within 5°F of the reference temperature taken in Step 6.2.2.1. The inspector also determined that the recorced reference temperature was high because the hydrometer had been left in the sun for a long period of time.

The inspector informed the licensee, who confirmed that the electrician had not allowed the electrolyte temperature to equalize to within 5°F of the reference temperature, 97°F. Immediately after determining that the surveillance had not been performed in accordance with procedural guidance, the licensee performed the surveillance again. The specific gravity readings of the electrolyte were found to be satisfactory and nearly identical to the previous surveillance results. The licensee also modified the procedure, counseled the involved individual, and briefed all electrical maintenance personnel of the occurrence. The inspector concluded that, while the surveillance had not been performed in accordance with procedural guidance, there did not appear to be any significance in this specific case. However, the inspector also concluded that the failure to follow the procedural guidance could have been more significant under different circumstances. This failure constitutes a violation of minor significance, and is being treated as a noncited violation, consistent with Section IV of the NRC Enforcement Policy.

4.2 Other Surveillance Tests

The following surveillances were observed:

Unit 3

- SO3-II-11.1, Section 6.2.12, "Functional Test Unit 3 Auxiliary Breaker 3AO419"
- SO23-V-3.5.6, TCN 0-11A, "Inservice Testing of LPSI Pump header Suction Valves"

These surveillances were performed adequately.

5 ONSITE ENGINEERING (37551)

5.1 Plant Modifications not Appropriately Reflected in Procedures

On August 8, 1995, the inspector observed operators returning Unit 3 Battery Charger 3D4 to service, following a Train B electrical outage. The inspector noted that the equalizing timer switch had been replaced with a toggle switch. The operators were using Procedure SO23-6-15, TCN 5-19, "Operation of the 125-VDC Systems." The inspector noted that Step 2.9.6 ("Equalizing Timer Off Unless it is Desired to Overcharge Battery to 140-VDC," Attachment 3, "Returning a Charger to Service") was still worded for the equalizer timer to be off, as opposed to the toggle switch. The inspector noted that the operator used this step to place the charger into the equalize mode, and did not stop to get the procedure appropriately changed to recognize the modified configuration. The inspector also noted that Steps 6.2.3.5 and 6.2.3.6 still referenced the equalizing timer rather than the toggle switch. The inspector reviewed the field change package which replaced the equalizing timer (Field Change Notice F11216E implemented May 30, 1995,) and WARs 3-R8D1002 through 3-R8D4002 which authorized the change to commence, and noted that no procedures were anticipated to be affected. The inspector concluded that procedures would be affected, and brought this to the attention of the licensee. The licensee discovered that the Operations procedure group had a list of procedures to be changed, but that the WAR originator had erroneously evaluated this change as not affecting any procedures. The licensee initiated an interdivisional investigation report to determine the cause. Programmatically, the inspector determined that the WAR was the controlling document that should have identified procedures that needed to be changed.

The inspector noted that on August 13, 1995, the automatic transfer to alternate power for Unit 2 Class 1E Bus 2A06 was inadvertently disabled. This was because the alternate power supply (Unit 3 Bus 3A06) was identified electronically as being in a safety injection actuation signal (SIAS) condition, as a result of a SWC pump having been started for performance of a routine surveillance. The modification to inhibit the automatic transfer capability when a SIAS signal was present had been installed as a degraded grid design change, but the involved surveillance procedure (SO23-2-8, Attachment 15, Revision 12, TCN 25) had not been revised to recognize the effect of the modification. The design change, MMP 2/3-2060.00SE, "Class 1E Degraded Voltage Protection System Enhancement," was implemented on August 8, 1995. The condition was created at 4:50 a.m. on August 13 by starting the Unit 3 Train B SWC pump using a SIAS relay. This caused Unit 2 Bus 2A06 to lose its ability to transfer to the second offsite power source. The condition was noted by licensee personnel checking a defense-in-depth sheet at 2:00 p.m. The inspector noted that this condition caused a failure to comply with TS 3.8.1.1 in that the operability of the other offsite power source was not checked within one hour of the occurrence. This licensee-identified and corrected violation is being treated as a noncited violation, consistent with Section IV of the NRC Enforcement Policy.

The inspector emphasized to licensee management that the above two examples were instances in which plant modifications were implemented, but applicable procedures were not appropriately revised to recognize the modifications.

5.2 Missed Opportunities to Correct Repetitive Equipment Problems

The inspectors noted several recent examples of repetitive equipment problems which appear to represent missed opportunities for the licensee to have thoroughly understood and corrected the full scope of the involved problems when they initially occurred. Specific examples included:

5.2.1 Safety-Related Valve Motor Actuator Failures

Since May 1995, the licensee has identified failures of motor-operated valves, and significant degradation of a valve. Unit 3 refueling water storage tank (RWST) outlet Isolation Valve 3HV9301 failed during valve testing, and failures of the outlet isolation valves for the other Unit 3 RWST and for one Unit 2 RWST were documented in NRC Inspection Report 50-361/95-07. These failures were caused by motor actuator problems. The inspector considered the incidence of failure of safety-related valves in general to be higher than expected, and noted that additional attention to the root cause of these failures appeared to be warranted.

5.2.2 WKM Valve Failures

During plant cooldown at the beginning of the Unit 3 Cycle 8 refueling outage, the licensee observed that SDC Valve 3HV9339 would not open more than 75 percent. The problem was determined to be caused by a broken rail inside the valve, and not a motor actuator problem. The valve, manufactured by WKM, was a 16-inch dual disk lever-lock valve. Previous similar problems had been experienced by the licensee on hydraulically-actuated main steam isolation valves. The licensee had determined, based principally on a third-party engineering evaluation, that the corrective actions taken for the main steam isolation valves did not need to be implemented on any motor-operated valves, because the motor-operated valves had a slower stroke velocity, which was considered a major contributing factor to the failures. The number of cycles was also a factor, and as the SDC valves were not frequently operated, they were not considered to be susceptible to the same failure mechanism. At the close of the inspection period, the licensee had not determined why this valve failed. The licensee inspected some other valves with very low or higher susceptibility to failure and found them all to be in good condition. One possibility the licensee considered was that a preexisting flaw in Valve 3HV9339 may have made it more susceptible to failure than other similar valves. However, in light of the failure of Valve 3HV9339, the licensee made modifications to the valve internals and was considering prudent preventative actions for other WKM valves.

The inspector concluded that the licensee had thoroughly evaluated and corrected the recent failure of Valve 3HV9339, but previously may not have

accurately assessed the susceptibility of the WKM SDC valves to the failure of their internals.

5.2.3 RCP 3P002 Baffle Bolt Failure

During the Unit 3 Cycle 8 refueling outage, the licensee investigated anomalous vibration phase angle shifts observed in RCP 3P002 during the operating cycle. While the vibration magnitude increased modestly (about 2.5 mils), the phase angle increased markedly during the cycle. Upon disassembly and inspection of the pump during the outage, the licensee identified that five of the six cap screws securing the seal cooler baffle were broken as a result of fatigue failure, and that the baffle was cocked inside the heat exchanger, rubbing at the lowest point.

The licensee determined that the bolt failure occurred due to a loss of preload on the bolts. A high-vibration event at the end of the Cycle 7 refueling outage may have contributed to the condition. Additionally, the licensee found that the alignment of the holes in the baffle with the mounting holes was imperfect, which could have resulted in the bolt heads being slightly cocked, substantially increasing the stresses at the head. The seating surface of the baffle was also found to be not uniform, and vibration could cause high spots to wear down, resulting in a loss of bolt preload.

The licensee discussed its analysis and actions in a meeting with NRC management in Region IV on August 23, 1995. During the meeting, the licensee discussed the effectiveness of corrective actions for the previous events during which baffle bolts were found loose or broken. As a result of the current situation, the licensee replaced the baffle and bolts. Additionally, the licensee verified that the torque on the baffle bolts in the three other RCPs in Unit 3 was adequate.

The inspector concluded that the licensee's recent engineering actions in monitoring and inspecting the RCP, identifying and evaluating the deficiencies, and determining appropriate corrective actions, were excellent. However, the inspector also noted that more thorough engineering attention following previous occurrences of RCP baffle bolt failures may have prevented the most recent problem.

6 PLANT SUPPORT ACTIVITIES (71750)

6.1 Radiological Controls

6.1.1 Cigarettes Found in Radiologically Controlled Area

On August 8, 1995, the inspector observed a maintenance worker performing pipe support modifications associated with high pressure safety injection Pump 3P018 in the Unit 3 safety equipment building. The worker's hard hat was on the floor and contained a package of cigarettes, contrary to licensee policy. There was no evidence that the worker had been smoking inside the radiologically controlled area. Upon notification, licensee Health Physics

personnel confiscated the cigarettes. The inspector concluded that the licensee took appropriate action in response to the worker's improper actions.

6.1.2 Chemistry Laboratory Spill

On June 6, 1995, a spill of reactor coolant mixed with nuclear service water occurred in the radiochemistry lab inside the Unit 2 and 3 common radiological controlled area. A chemistry technician had placed Unit 2 on a sample purge of the RCS letdown line to the Unit 2 sample sink drain, mixed with nuclear service water. The unit remained on purge for approximately 1 hour and 20 minutes, and at some point the sample sink overflowed and wetted the floor. The area was already posted as a contaminated area, and the sink was posted as a high contamination area. The chemistry technician secured the purge and the nuclear service water upon discovery of the spill. Approximately 20 gallons of reactor coolant mixed with 40 gallons of service water were spilled. Unit 3 was also on purge during this period, but the sample sink did not overflow. The two sample sinks were located in the same space.

The inspector interviewed the cognizant chemistry technician, reviewed the procedure controlling the evolution (SO123-III-1.6.23, TCN 9-1, "Units 2/3 - Normal Operation of the Reactor Coolant Sample System"), reviewed DIR 95-004 (which the licensee performed as a result of the spill), and visually inspected the space the morning after the spill while cleanup was in progress, and again on June 14, 1995.

The inspector noted the following during the visual inspection on June 14, 1995:

- The Unit 2 sample sink was not in use and had one leaking sample point, to the drain, of approximately 3-4 drops per second. The inspector determined that the licensee had first attempted to repair this leak in 1993 (MO 93041107000), had failed twice in rebuilding the valve, and was planning on replacing the valve in the future. The inspector considered that two years to repair or replace Valve S21212MU167, and stop the leak, was excessive.

- There was a significant amount of black crud material in the back right corner of the sink, above the drain trough. In response to the inspector's comment, the licensee cleaned the sample sink.

- Unit 3 had a hose rigged from a common sample isolation valve drain line located in a shielded area behind the sink, routed around a cement wall and into the sink, with the glass doors ajar. This was routed so as to provide for drainage into the sample sink drain. The hose had a flow of 1-2 drops per second. The licensee was implementing Field Change Notice F-11069 to cut out a valve and cap the line to try and stop the leakage. The inspector will check for leakage when the reactor coolant system is pressurized during the course of normal inspection.

The inspector noted the following during the interview and procedure review:

- The technician was experienced and had appeared to perform the samples in a manner consistent with the procedure and chemistry supervision expectation. The procedure was silent as to ensuring proper drainage, as well as to personnel in attendance during a purge.

The inspector reviewed the DIR and noted that the licensee-assessed root cause was that a piece of tape that had been used to secure the drain screen had become loose and blocked the drain. The licensee revised Procedure SO123-III-1.6.23 to provide for checking the drain and monitoring for drainage periodically during sampling. The licensee also installed a proper screen to prevent sink drain stoppage. Another corrective action was to remove all foreign material from the sinks.

The inspector concluded, overall, that the DIR adequately addressed causes and corrective actions; however, since one corrective action was to remove all foreign material from the sink, the inspector finding crud in the sink demonstrated that more diligence was necessary. In addition, the inspector noted that the licensee had tolerated leaks in the sinks for years and had been inconsistent in prioritizing repairs.

6.2 Physical Security

6.2.1 Escort Leaving Unauthorized Individual in Protected Area (PA)

On August 23, 1995, the inspector exited the PA and noted that an individual requiring escort was inside the PA trying to get out, but that the turnstile was locked. The inspector noted that the escort had already exited the PA. This was contrary to management expectation, as well as to the sign posted at the turnstile. Security responded, letting the individual out. The inspector concluded that this was of low safety significance, since the individual was within sight of the escort.

7 FOLLOWUP - ENGINEERING (92903)

7.1 (Closed) Unresolved Item 361/9504-02; 362/9504-02: Wrong Addressable Constants in Core Protection Calculators (CPCs)

This item involved the licensee's discovery that the wrong addressable constants were installed in both Unit 2 and Unit 3 CPCs during plant operation. Specifically, incorrect rod shadowing factors were used in Unit 2 throughout Cycle 7 operation and in Unit 3 for about 15 months of operation (until March 31, 1995, the date of discovery). The licensee discovered that Asea Brown Boveri (ABB) had provided incorrect Cycle 7 data for both units and that licensee personnel had entered data designated for Unit 2 into the Unit 3 CPCs at the start of Cycle 7. The inspector interviewed pertinent licensee personnel and reviewed the original paperwork used to install the Unit 3 and Unit 2 addressable constants, the ABB root cause analysis, the ABB assessment

of safety significance, the licensee's event report (LER), the licensee's DIR, and current procedures for control of addressable constants.

The inspector noted the following:

- The ABB error was limited to the Cycle 7 operating period, and was due to a series of personnel errors. The wrong values were used by the licensee because preliminary values were sent by ABB and were not subsequently converted to final values, as should have been done. Corrective actions included more procedural guidance, stricter planning, and implementing an electronic versus paper management system. In addition, ABB will no longer transmit preliminary values, only final values.

- The licensee's error was due to a personnel error in transcription and to a lack of thorough review. The licensee revised their procedures to change the review from a reactor engineer and a nuclear software/reactor engineer to a reactor engineer and a supervisor. In addition, the licensee was working with ABB to have the values submitted in a format which would allow direct installation of the values, as opposed to transcription and installation the constants.

- The safety assessment indicated that although the error was nonconservative, adequate design margin existed to provide protection. This was because worst-case power nonconservatism due to the incorrect multipliers was 2.8 percent, and the minimum safety margin in affected automatic reactor trips was 3.8 percent.

The inspector concluded the following:

- Based on a review of the ABB assessment submitted to the licensee, corrective actions appeared adequate. Additionally, the licensee's assessment and corrective actions were adequate.

- Although the errors reduced the margin of operation to safety limits, the reactor was operated within analyzed limits due to conservatism built into the trip setpoints. Thus, given the worst case rod pattern and potential accident, no safety limits would have been exceeded.

7.2 (Closed) Violation 361/9504-03: Inadequate Corrective Actions Concerning Agastat Relays

This violation involved a failure to take corrective actions when pneumatically-operated Agastat relays repeatedly failed to meet TS-required accuracy during refueling interval surveillance testing. The Agastats are used to time emergency core cooling equipment automatic starts in the event of a SIAS. The inspector reviewed the licensee's response to this violation, dated July 11, 1995, and had further discussions with licensee personnel.

The inspector noted that, although the Agastats had high failure rates in meeting the TS criteria of plus or minus 10 percent of the interval period between load groups, no Agastats exceeded analyzed start times in the Updated Final Safety Analysis Report Chapter 15 accident analysis. The inspector also noted that the licensee had performed an analysis to demonstrate that the EDGs could maintain voltage with adjacent load groups starting simultaneously. Based on further review, the inspector assessed the safety significance of the repetitive failures as minor. Consequently, the violation is changed to a noncited violation, consistent with Section VII of the NRC Enforcement Policy.

8 ONSITE REVIEW OF LERs (92700)

The following LERs were closed through direct observation, discussion with licensee personnel, or review of the records:

8.1 (Closed) LER 361/95-013, Revision 0: Violation Resulting From a Wet Post-Accident Cleanup Unit

The inspector reviewed the LER, other licensee written evaluations, interviewed pertinent personnel, and visually inspected the wetted component. The inspector concluded, overall, that the licensee's assessment of root cause (leaking valve due to buildup of corrosion products) and corrective actions (replacement of the valve and revising procedures to be more readily able to prevent spraying components in the future) were adequate given the information available at the time.

Subsequently, Unit 3 RCP Motor 3P001 was inadvertently wetted during performance of a similar surveillance on August 7, 1995. In this instance the spray was readily detected, and the surveillance was stopped. The event was caused by valve leakage as a result of corrosion, which prevented the valve from being fully shut. After this second occurrence, the licensee stated that surveillance procedures would be revised to require an open drain valve such that water would not accumulate in piping and drain on components. The inspector concluded that the licensee's response to the second occurrence was appropriate.

9 IN-OFFICE REVIEW OF LERS (90712)

The following LERs were closed based on in-office review:

- 361/95-012, Revision 0: Typographical Error in Containment Lock Surveillance Requirement
- 361/95-007, Revision 0: Incorrect Rod Shadowing Factors

ATTACHMENT 1

1 PERSONS CONTACTED

1.1 Licensee Personnel

*D. Breig, Manager, Station Technical
C. Chiu, Manager, Quality Engineering
*J. Fee, Maintenance Manager
*D. Franklin, Engineer, Compliance
*W. Frick, Supervisor, Nuclear Safety Concerns
*G. Gibson, Supervisor, Compliance
D. Herbst, Manager, Quality Assurance
*J. Joy, Supervisor, Plant Maintenance
P. Knapp, Manager, Health Physics
*R. Krieger, Vice President, Nuclear Generating Station
H. Newton, Manager, Site Support Services
*G. Plumlee, Supervisor, Compliance
*L. Pressey, Manager, Business Administration, Maintenance
J. Reeder, Manager, Nuclear Training
*J. Reilly, Manager, Nuclear Engineering & Construction
*R. Rosenblum, Vice President, Nuclear Engineering and Technical Support
*R. Sandstrom, Manager, Nuclear Training Department
*J. Schramm, Manager, Safety Engineering
*M. Short, Manager, Site Technical Services
*K. Slagle, Manager, Nuclear Oversight
*M. Speer, Manager, Security
*A. Thiel, Manager, Electrical Systems Engineering
*T. Vogt, Plant Superintendent, Units 2/3
*R. Waldo, Operations Manager
*M. Wharton, Manager, Nuclear Design Engineering
W. Zintl, Manager, Emergency Preparedness

1.2 Other Personnel

*S. Harris, Organization Consultant/Trainer, Viability Group, Incorporated

1.3 NRC Personnel

J. Russell, Resident Inspector
*J. Sloan, Senior Resident Inspector
*D. Solorio, Resident Inspector

In addition to the personnel listed above, the inspectors contacted other personnel during this inspection period.

*Denotes personnel that attended the exit meeting.

2 EXIT MEETING

An exit meeting was conducted on September 6, 1995. During this meeting, the inspectors reviewed the scope and findings of the report. The licensee acknowledged the inspection findings documented in this report. The licensee

did not identify as proprietary any information provided to, or reviewed by, the inspectors.

ATTACHMENT 2

ACRONYMS

ABB	Asea Brown Boveri
CCW	component cooling water
CEDMCS	control element drive mechanism control system
CWO	construction work order
DIR	division investigation report
EDG	emergency diesel generator
FME	foreign material exclusion
LER	licensee event report
LPSI	low pressure safety injection
MO	maintenance order
PA	protected area
PEO	plant equipment operator
RCP	reactor coolant pump
RCS	reactor coolant system
RWST	refueling water storage tank
SDC	shutdown cooling
SG	steam generator
SIAS	safety injection actuation signal
SWC	salt water cooling
TCN	temporary change notice
TS	Technical Specifications
WAM	work authorization modification
WAR	work authorization record