APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION V

Inspection Report: 50-361/94-02
50-362/94-02

Operating Licenses: NPF-10
NPF-15

Licensee: Southern California Edison Company
Irvine Operations Center
23 Parker Street
Irvine, California 92718

Facility Name: San Onofre Units 2 and 3

Inspection At: San Onofre, San Clemente, California

Inspection Conducted: January 1 through January 31, 1994

Inspectors: J. A. Sloan, Senior Resident Inspector
J. J. Russell, Resident Inspector
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Approved By: Howard J. Wong 3/1/94
H. J. Wong, Chief Date Signed
Reactor Projects Branch II

Inspection Summary

Areas Inspected (Units 2 and 3): Routine, announced, resident inspection of onsite followup of events, operational safety verification, plant maintenance, surveillance observations, emergency preparedness drill, followup on corrective actions for violations, followup, and in-office review of licensee event reports.

Results (Units 2 and 3):

Strengths:

- Licensee response to the Northridge earthquake was excellent and exceeded procedural requirements (Paragraph 2.1).
- The licensee successfully accomplished a recall of emergency response personnel within the required response time during a drill (Paragraph 6).
- The licensee's root cause of failure determination for a partial loss of annunciator event was thorough and appropriate corrective measures were

implemented. Preventative measures for safety-related applications were determined to be in place before the event (Paragraph 8.3).

- Although the licensee failed to modify the acoustic monitor system during the construction phase to reflect the vendor's seismic qualification report received after the installation, the licensee's corrective actions were thorough (Paragraph 8.2).

Weaknesses:

- A violation was identified regarding failure to adequately review the configuration of open watertight doors and a removed floor plug (Paragraph 8.4).

- A non-cited violation resulted from an operator failing to observe radiation exposure permit requirements related to contamination control. Several examples of material laying across contaminated area boundaries were also identified, indicating a weakness in implementation of contamination controls (Paragraph 3.3).

- One example of measuring and test equipment (M&TE) beyond its calibration due date was observed at a work location. Although further review identified that 119 pieces of M&TE were overdue for calibration and were still in the field, no evidence was found that any of the M&TE was used after its calibration expired (Paragraph 4.1.1).

- Although the work was appropriately controlled and technically adequate, a maintenance foreman did not know what authorized or controlled work he was directing on RCP 3P003 (Paragraph 4.2).

- A non-cited violation was identified related to the containment emergency sump covers not conforming to the approved facility design (Paragraph 8.3).

- The inspector identified confusing data blocks and acceptance criteria in a step in the HPSI pump overhaul procedure (Paragraph 4.1.2).

Summary of Inspection Findings:

- A non-cited violation was identified (Paragraph 3.3.2).

- Unresolved Item 362/94-02-02 was opened (Paragraph 4.1.3).

- Violation 361/93-19-05 was closed (Paragraph 7).

- Inspection Followup Item 361/93-19-01 was closed (Paragraph 8).

- Unresolved Items 361/93-11-09, 361/93-38-03, 362/93-29-01, and 361/93-11-10 were closed (Paragraph 8).

- A non-cited violation was identified (Paragraph 8.4).

- A violation was identified (Paragraph 8.5).

- Licensee Event Reports 361/93-009, 361/93-010, 362/93-002, 362/93-004, 362/93-005, and 362/93-006 were closed (Paragraph 9).

Attachments:

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

DETAILS

1 PLANT STATUS (71707)

1.1 Unit 2

The Unit operated at 98 percent of rated thermal power throughout this inspection period except for a planned downpower to 80 percent on January 14 - 15, 1994, to support heat treatment of the circulating water system.

1.2 Unit 3

At the beginning of this inspection period, the Unit was operating at 68 percent of rated thermal power after startup from the Unit 3 Cycle VII refueling outage, with power increasing to 80 percent to support heat treatment of the circulating water system. On January 2, 1994, power was raised to 98 percent. On January 17, 1994, power was reduced to 90 percent to facilitate removal of a feedwater heater from service to allow repair of a steam leak on a feedwater isolation valve. The licensee was unable to bypass the feedwater heater and the Unit was returned to full power later that same day. The Unit operated at essentially 98 percent power through the end of the inspection period.

2 ONSITE RESPONSE TO EVENTS (92701 and 93702)

2.1 Northridge Earthquake

On January 17, 1994, at 4:31 a.m. (PST), a major earthquake, measuring 6.6 on the Richter scale was felt at the site. The earthquake was centered approximately 79 miles northwest of the site and did not result in any damage or interruption of operations at the site. Only one of the installed seismic monitors at the site detected the earthquake, registering 0.025 g acceleration in the horizontal direction. The design basis earthquake for the facility is 0.67 g.

The inspectors responded to the site and reviewed the impact of the quake on the units. Although the licensee determined that no spent fuel pool (SFP) level alarms were received, the Unit 3 SFP purification system inlet filter became clogged and required more frequent backwashing for the next three days. Plant walkdowns by the licensee and inspectors did not reveal any damage or other problems resulting from the earthquake. The licensee walkdowns were not required by licensee procedures because of the low magnitude of the accelerations, but were performed at licensee management discretion.

The licensee did note that grid frequency increased momentarily to 60.9 Hertz due to loss of load on the grid, but stabilized at 60.0 Hertz within about 10 minutes. This resulted in turbine speed increasing, though substantial margin to overspeed trip setpoints remained.

During a conference call with the senior resident inspector, Region V, and NRC headquarters staff personnel, the licensee stated that its emergency response

capability was not affected, as there were no road closures within about 60 miles.

2.2 Conclusions

The inspector concluded that the licensee's response to the earthquake was appropriate and exceeded procedural requirements.

3 OPERATIONAL SAFETY VERIFICATION (71707)

3.1 Main Steam Isolation Valves

On January 18, 1994, the inspector noted a leak in the hydraulic control oil system for main steam isolation valve 2HV8205 in Unit 2. While the leak had been previously identified by the licensee, and a maintenance order (MO) issued, the leak rate had increased without the licensee's notice. As a result of the inspector's observation, the licensee increased the priority of the MO and repaired the leak the next day. Because the leak rate was still low and the hydraulic level was monitored in the control room with an alarm providing sufficient margin to ensure operability, the inspector concluded that the safety significance of the leak was low and that the licensee's actions were adequate.

On January 27, 1994, the inspector noted another leak in the hydraulic control oil system for the same main steam isolation valve (2HV8205) in Unit 2 which had not been previously identified by the licensee. Specifically, vent valve MR-1080 was leaking hydraulic fluid from its packing. This condition was not labeled with a deficiency tag; therefore, the inspector contacted the shift superintendent who initiated a MO to correct the deficiency. Because the leak rate was still low and the hydraulic level was monitored in the control room with an alarm providing sufficient margin to ensure operability, the inspector concluded that the safety significance of the leak was low and that the licensee's actions were adequate.

3.2 Reactor Coolant Pump (RCP) Seal Instability

3.2.1 RCP 3P004 Seal Abnormalities

On January 10, 1994, the middle seal for Unit 3 RCP 3P004 degraded (i.e., disengaged and did not provide full pressure breakdown) for approximately 90 minutes. The seal then appeared to reseat. Operators noted that controlled bleedoff temperature from the seal package increased 7 °F and the pressure below the seal decreased while the pressure above the seal increased. Controlled bleedoff temperature remained elevated with flow increasing slightly. The pressure changes resulted in the differential pressure of the middle seal decreasing to approximately 150 psid. Normal middle seal differential pressure is approximately 750 psid. Approximately five minutes after the initial changes, parameters began to trend back to normal, with all parameters returning to normal in approximately 90 minutes. The inspector noted that the licensee's criteria for seal failure was less than 100 psid differential pressure across a seal.

The inspector noted that the licensee had experienced spiking of seal parameters in the past, but not what appeared to be the unseating and reseating of a seal over a 90 minute time frame. The inspector also noted that the seal package consisted of three full pressure seals and a vapor seal. The seals were designed such that the loss of one full pressure seal would not effect the seal packages ability to seal the RCP shaft.

The inspector assessed operator actions taken as a result of the seal degradation and concluded that they were adequate. Telephone discussions were held with the inspector, the NRC regional office, the Office of Nuclear Reactor Regulation, and the licensee. The inspector will continue to monitor the performance of this seal package during future inspections.

3.2.2 RCP 2P003 Seal Pressure Spikes

Throughout this inspection period, the licensee observed frequent pressure spikes on the upper seal of RCP 2P003 in Unit 2. The spikes were about 150 psi in magnitude. The licensee increased monitoring of the seals, but did not consider the spikes significant. The inspector concluded that the licensee's assessment was adequate.

3.3 Radiation Protection Contamination Controls

3.3.1 Material Controls

The inspector noted seven instances of objects being partially in posted contamination areas in the Unit 3 radwaste and safety equipment buildings. These were as follows:

Date (January 1994)	Area	Object
5	Room 5	Floor duster
5	Room 3	Unsecured hose
19	Room 205B	Electrical cable
20	Room 9	Wrench
27	Room 2	Electrical cable
30	Room 9	Plastic bottle
30	Room 17	Cart

In each instance, the inspector informed Health Physics or Maintenance personnel and corrective actions were promptly taken. The licensee confirmed that these conditions were not in accordance with management expectations. The inspector concluded that the duster, the wrench, the bottle, and the cart had not been surveyed and partially released from the contaminated area. It appeared that these items had been inadvertently placed crossing contamination boundaries.

The inspector considered that these were isolated instances and that the licensee's program to control contamination was adequate. However, the inspector will continue to monitor for occurrences such as these during normal inspection activity.

3.3.2 Personnel Practices

On January 21, 1994, the inspector observed an Unit 2 operator perform valve manipulations in accordance with SO23-3.2.1, "CVCS Charging and Letdown," Attachment 17, "Flushing the Charging Pump Seal Water Reservoir," to start reactor coolant system Charging Pump P191.

The operator performed the valve manipulations in accordance with Attachment 17 inside a contaminated area, using a copy of the attachment. The operator exited the contaminated area with the attachment in his possession, and the inspector observed the operator reach back into the contaminated area, without gloves on his hands, to return the attachment to the contaminated area.

The operator's Radiological Exposure Permit (REP) required that in the absence of an health physics technician, a potentially contaminated item should be placed in a bag prior to removal from the contaminated area. In addition, the operator's REP required that protective clothing be worn when entering contaminated areas. The intent of this requirement was to minimize contamination of the individual. The inspector noted that the operator did not follow the requirements of his REP, removing the potentially contaminated item from the contaminated area without first placing it inside a bag or wearing protective clothing while handling the attachment. The inspector also noted that Procedure SO123-VII-20.10.1, "Radiation Exposure Permits," Objective 1.1, required in part that precautions and protective measures specified on REPs are to be adhered to in order to control individual exposures, and the spread of contamination.

The inspector concluded that the removal of the potentially contaminated attachment from the contaminated area without the requisite protective measures specified by the REP was not in accordance with the REP or procedural requirements, and was a violation.

The inspector considered the significance of this incident low because the operator was not found to be contaminated and the attachment was only a short distance outside the contaminated area. The operator was counseled by the licensee on the importance of adhering to REP requirements. The inspector considered the licensee's corrective actions adequate. Therefore, this violation is not being cited because the requirements of Section VII.B.(1) of the Enforcement Policy were satisfied (NCV 50-361/94-02-01).

3.4 Operator Logs

The inspector noted that on three separate occasions Unit 2 control operators had made incorrect log entries. These errors involved the documentation of the wrong equipment identifier for a letdown control valve, the wrong time for return to service of an atmospheric dump valve after a surveillance, and the omission of status for various core operating limits supervisory system parameters in the daily record of plant status. After being identified, all three errors were promptly corrected.

Based on the low safety significance of the errors the inspector considered the licensee's action adequate. The inspector will continue to monitor the licensee's performance in this area as part of routine inspection activities.

3.5 Conclusions

Licensee response to the inspector's identification of two minor oil leaks in the main steam isolation valve control system was appropriate.

Licensee assessment of abnormalities identified in the seals of RCPs 2P003 and 3P004 was appropriate.

A non-cited violation was identified by the inspector when an auxiliary operator removed pages of a procedure from a contaminated area without following the applicable REP requirements. Additionally, good contamination control practices were not followed in other activities, as demonstrated by the inspector identifying several examples of materials being left laying across contaminated area boundaries. These were all isolated instances of low safety significance. Licensee response to each instance was prompt and appropriate.

Several examples of minor log errors were identified by the inspector and were promptly corrected by the licensee. The licensee's response was appropriate.

4 PLANT MAINTENANCE (62703)

During the inspection period, the inspector observed and reviewed selected documentation associated with 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.

Specifically, the inspector witnessed portions of the following maintenance activities:

Unit 2

- Replace seismic monitor in containment (elevation 63')
- Repair/replace magnet retaining clips of RCP 2P003 controlled bleed-off flow transmitter 2FIT0160
- Investigate failure of Unit 2 reactor trip circuit breaker number 1 to reclose using associated plant protection system (PPS) - reset pushbutton
- Remove atmospheric dump valve 2HV8419 solenoid operator 2HV8419C housing cover and inspect for signs of water intrusion

- Repair leak in main steam isolation valve 2HV8205 hydraulic skid recirculation filter cartridge
- Troubleshoot/repair excessive ripple in PPS channel "A" power supply
- Furmanite repair of MU745

Unit 3

- Repair charging pump P191 discharge relief valve
- Calibrate sample flow of fuel handling area radiation monitor 3RT7823-2
- Overhaul HPSI pump 3P019
- Align motor 3M003 to RCP 3P003

4.1 High Pressure Safety Injection (HPSI) Pump Overhaul

The inspector observed maintenance activities associated with the repair of Unit 3 HPSI pump 3P019. The pump was exhibiting high vibration, low discharge pressure and low flow while being used for a test of containment emergency sump check valve MU004 on November 24, 1993. The pump was then run on miniflow with a suction from the refueling water storage tank and again demonstrated the same problems. The pump was declared inoperable, as documented in Nonconformance Report (NCR) 93110129, on November 25, 1993.

4.1.1 Measuring & Test Equipment (M&TE) Observations

On January 18, 1994, the inspector found an outer diameter micrometer (M1-3085) with an indicated calibration due date of January 12, 1994, in the HPSI Pump 3P019 work area. The micrometer was lying adjacent to HPSI Pump P019, but the inspector did not observe it being used on the pump. The licensee informed the inspector that the micrometer had been used under MO 93110179 to repair HPSI Pump 3P018, which had been previously rebuilt, and the tool had been consolidated into the work area for HPSI Pump 3P019. The inspector confirmed that the micrometer was listed as being used on the MO for HPSI Pump 3P018, and not on the MO for HPSI Pump 3P019. The micrometer was in calibration when it was used on HPSI Pump 3P018. The licensee removed the micrometer from the work area.

The inspector reviewed a Test Equipment Management System report printed January 20, 1994, and noted that 119 pieces of M&TE were overdue for calibration and issued to individuals for use. The inspector verified that none of this overdue M&TE was listed on data recorded from M&TE travelers in the report data base as having been used after its calibration due date. The inspector did note that users were requested to turn in their M&TE for calibration such that it would be in the M&TE shop and not in the field if its calibration had expired. The inspector noted that the licensee had approximately 7000 pieces of M&TE and that 119 was a relatively small number. However, the inspector considered that the practice to return overdue M&TE to

the shop was one barrier to prevent its inadvertent use. The inspector noted that the shop took efforts to retrieve the M&TE and considered this adequate, and encouraged the licensee to continue its efforts to remove M&TE with expired calibration from the field.

4.1.2 Overhaul Procedure Observations

On January 27, 1994, the inspector noted that Steps 6.3.9.14.5 and 6.3.9.14.4 of Procedure SO23-I-5.8, "High Pressure Safety Injection Pump Overhaul," required that the machinists center the pump shaft horizontally and vertically after measuring movement of the shaft with the bearings installed, but not tightened. The inspector considered these steps confusing because two recordings of measurements were specified, but only one line was provided to record the data. In addition, the listed acceptance criteria was not for the data recorded directly below and the recorded data had no acceptance criteria. The licensee initiated a temporary change notice of this procedure to clarify these steps. The inspector verified that the machinists had correctly performed the intent of the steps while working on HPSI Pump 3P019. The inspector concluded that the licensee's actions were adequate.

4.1.3 Technical Manual Observations

The inspector reviewed the vendor-supplied Technical Manual, SO23-933-68, "Ingersoll-Rand HPSI Pump Manual," and noted that selected portions of the "High Pressure Safety Injection Pump Overhaul" procedure were written in accordance with this manual. The inspector noted that vendor technical bulletins dated 1979 and 1984 were not incorporated into the manual until October 12, 1990. Based on discussions with the licensee and supervisory members of Ingersoll-Rand's pump company Technical Services Division, the inspector concluded that the vendor routinely distributed technical updates to their own field service representatives, but not to equipment holders. The Ingersoll-Rand representatives informed the inspector that safety significant information would be distributed in a timely fashion by methods other than technical updates, which served to supplement the technical manual. The inspector noted that the vendor technical bulletins mentioned above were enhanced methods for ensuring the rotor was centered without the balance drum installed and that they did not change specifications. The inspector considered this method adequate.

The inspector noted that the technical manual had a "CAUTION" on Sheet 43 stating: "Before starting or while operating the pump, the casing and suction line must be completely filled with the liquid being pumped. The rotating parts depend on this liquid for lubrication and the pump may seize if operated without liquid." In addition, Step 13 of the normal starting procedure in the technical manual stated to check leakage from the vent line prior to starting the pump. The licensee procedure had provisions for refilling and venting the suction and discharge lines if the operations personnel felt this was necessary. The inspector was informed that this would be done following maintenance. The inspector also noted the operators routinely performed monthly venting of this system, along with other systems.

The licensee informed the inspector that the system had not been vented between November 3, 1993, and November 25, 1993. On November 3, 1993, HPSI Pump 3P018 was run deadheaded without a discharge path and the suction thermal relief valve 3PSV8154 of HPSI Pump 3P019 lifted. This relief valve was on the common suction line to the HPSI pumps and set to lift at 110 psig. The licensee determined that the water could have reached 250 °F when the thermal relief valve lifted. HPSI Pump P019 was run about 20 hours later on the same day to continue to fill the reactor cavity from the refueling water storage tank. On November 25, 1993, the suction and discharge sections of the HPSI piping were vented by operators as part of the normal monthly venting process.

When HPSI Pump P019 was run for valve testing on November 25, 1993, the licensee identified that there was lower than expected discharge pressure and flow, and high vibration. The licensee's subsequent investigation of the pump revealed significant wear between the pump impellers and the wear rings. Based on available information, the inspector could not determine whether cavitation or gas binding of the pump caused the pump damage. The inspector noted that the as-found radial tolerances between the rotating and stationary parts of the impeller bundle were out of specification (too close) and that the axial tolerances were also too close. In addition, the bundle wearing rings experienced metallic deformation. The licensee was evaluating the root cause for this damage at the end of the inspection period. The inspector will evaluate this root cause as an unresolved item (URI 50-362/94-02-02).

4.2 Reactor Coolant Pump (RCP) 3P003 Motor Alignment

On December 23, 1993, the inspector observed mechanical maintenance personnel aligning the shaft of RCP 3P003 motor in Unit 3. The workers were centering the shaft at the upper radial bearing and "locking" it in place with a one-mil clearance. The foreman, while very knowledgeable of the work sequence being performed, was unable to tell the inspector what work document governed his work. He searched through the procedure present at the job site, S023-I-8.231, "Motor-Reactor Coolant Pump Motor Bearing Inspection and In Place Maintenance," to try to find a step describing the tasks being performed, and appeared confused as to why the task was not in the procedure. In subsequent discussions, the inspector determined that the foreman was working under verbal direction of the maintenance supervisor, who was present at the lower radial bearing of the motor, per MO 93121570. The general sequence of activities had been discussed by Maintenance and Station Technical divisions much earlier, though the specific actions being performed were not included in a procedure. The inspector concluded that the foreman should have known what authorized and directed his work activities, but that the activities were in fact authorized. The licensee stated that the foreman did know what authorized his activities, though his actions at the time apparently did not reflect that. The licensee discussed the issue with the foreman to reaffirm the expectation.

4.3 Radiation Monitor Sample Flow Calibration

On January 20, 1994, the inspector observed technicians attempting to calibrate the sample flow for an area radiation monitor per MO 93120851 in Unit 3. The technicians were experiencing difficulty obtaining the expected

flow rates. They determined that their difficulty was the result of using a mass flow meter with an inappropriate range (0-5 standard liters per minute, instead of 0-5 standard cubic feet per minute). The procedure only specified the use of a Kurz Instruments, Inc. mass flow meter. As no work was completed using the incorrect meter, there was no safety impact of the error. The technicians later completed the work with an appropriate meter. The inspector concluded that the technicians had selected the incorrect meter, but that the inappropriate selection was self-revealing and not significant in this case.

4.4 Controls for Use of Furmanite

The inspector reviewed MO 93120738000 and Procedure SO123-XXVII-20.13, "Furmanite Engineering Procedures for Southern California Edison San Onofre Nuclear Generating Station," which was used to control the injection of Furmanite in the integral bypass valve (MU745) of feedwater control valve inlet block S21305MU035. The integral bypass valve is a nonsafety-related valve.

The injection method used involved drilling a tap into the valve bonnet to inject Furmanite to repair a packing leak and stop the small steam leak from the valve. The inspector noted that Section 3, "Major equipment required," Subsection 3.4, "Void Volume," for injection method #2, "Packing Gland Injection Procedure," of SO123-XXVII-20.13 was not filled in. The inspector was concerned that the injection of a volume of Furmanite greater than the void area in the packing could result in contamination of the process line. However, the inspector noted that the licensee had documented in Subsection 3.4 the use of one stick of Furmanite which was a very small amount. The licensee stated that the intent of Subsection 3.4 was to calculate void volume when performing repairs to through wall valve leaks, which involved construction of a container around the valve. The inspector considered the licensee's response adequate. The licensee indicated that a procedure was under development to centralize the process for the control of Furmanite into a single program document. The program will include specific guidance to consider to determine when the injection volume must be calculated. The inspector will review the new program as part of routine inspection activities.

4.5 Conclusions

The presence in the field of 119 pieces of M&TE with calibrations overdue, while a small percentage of all M&TE, presented a risk of unintentional use of out-of-calibration M&TE. However, the inspector did not identify any evidence of use of out-of-calibration M&TE, and licensee efforts to retrieve the M&TE for calibration were appropriate.

Licensee actions to clarify a confusing step in the "High Pressure Safety Injection Pump Overhaul" procedure, identified by the inspector, were adequate.

An unresolved item regarding the root cause of failure of HPSI 3P019 was identified.

One example in which a maintenance foreman did not know what authorized and controlled work he was directing was identified. The work, on RCP 3P003, was properly authorized and adequately controlled.

Technicians improperly selected M&TE with the wrong range for a radiation monitor sample flow calibration, which was self-revealing. This was an isolated case of poor attention to detail.

5 SURVEILLANCE OBSERVATIONS (61726)

Selected surveillance tests required to be performed by the Technical Specifications were reviewed on a sampling basis to verity 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 Technical Specifications; and 4) test results satisfied acceptance criteria or were properly dispositioned.

Specifically, portions of the following surveillances were observed by the inspector during this inspection period:

- Unit 2/SO23-3-3.30: Atmospheric Dump Quarterly Valve Test
- Unit 3/SO23-II-1.1.1: Reactor PPS Channel 'A' Channel Functional Test

6 EMERGENCY PREPAREDNESS DRILL (82301)

The inspector observed a licensee emergency preparedness drill conducted on January 12, 1994. The purpose of the drill was to recall plant personnel to staff emergency response facilities and then organize the personnel into operating shifts. The licensee, for drill purposes, declared an alert at 7:35 p.m. and initiated recall of plant personnel. The inspector directly observed that the emergency operating facility was manned at 8:18 p.m. Based on licensee reports, the operational support center was manned at 8:09 p.m. and the technical support center was manned at 8:24 p.m.

The inspector concluded that all emergency response facilities were manned in less than one hour from the time of event declaration, consistent with licensing commitments.

7 FOLLOWUP ON CORRECTIVE ACTIONS FOR VIOLATIONS (92702)

(Closed) Violation 361/93-19-05: Main Steam Safety Valve Lagging Removed

This violation identified that corrective actions taken to preclude repetition of main steam safety valve (MSSV) inoperability were not adequate to prevent the inoperability of MSSV 2PSV8411 in February 1993.

After the February 1993 event, the licensee committed to install signs near the MSSVs warning about the implications of lagging removal, and to make changes to the computerized maintenance management system to alert personnel

part of the original reviewer of the SPR. As a result of this occurrence, the licensee reviewed all SPRs currently active and identified two additional SPRs that had nonconforming conditions; NCRs were generated. The licensee planned to give additional training to all SPR validators to emphasize the importance of identifying nonconforming conditions through the NCR process and not the SPR process. The inspector considered these actions adequate.

8.2 (Closed) Inspector Followup Item 361/93-19-01: Partial Loss of Annunciators - Units 2 and 3

This item involved a partial loss of annunciators on July 4, 1993, with Unit 2 defueled for the Unit 2 Cycle VII refueling outage, and Unit 3 in Mode 1. The occurrence began with annunciator ground alarms activating on both Units. The operators then noted abnormal annunciator operation for annunciators that indicated the status of electrical systems, plant services common to both Units, and reactor services for Unit 3. The licensee replaced various circuit modules, including modules that controlled power to the annunciators and modules that controlled functions on individual annunciators. Normal annunciator function was restored on July 5, 1993.

The inspector reviewed the licensee's determination of the root cause for this occurrence, visually examined various associated electronic circuit boards, and assessed the licensees planned corrective actions. The inspector noted that while annunciators were important operational aides, they were a Quality Class IV system (i.e., nonsafety-related).

The licensee determined that filtering capacitors on a type AN-1158 power supply to the annunciators had failed. The annunciator system contains approximately 120 of this type of power supply. However, the power supplies to both Units 2 and 3 annunciator boards were in a ring bus configuration, so this failure was able to influence the power supply to all annunciators. The failure of the power supply produced excessive noise spikes in the voltage provided to the annunciator system. These noise spikes, which the capacitors would have normally filtered out, induced a known phenomenon, called complimentary metal-oxide semiconductor (CMOS) latch up, on downstream circuit cards that controlled individual annunciators. The CMOS latchup caused excessive currents, overheated devices, and caused circuit failures.

The failed power supply was manufactured by Rochester Instruments (model RA878). The power supply was fed 125 VDC and converted the DC to various DC voltages for the downstream annunciator cards. The licensee determined that the filtering capacitors on these power supplies had an approximately 10 year life, and the inspector noted that one failed capacitor was manufactured in 1976.

The licensee evaluated the power supply design and planned to replace all power supplies for Units 2 and 3 with power supplies that contained enhanced components. At the end of this inspection period, the licensee had completed their evaluation of the power supply design and was in the process of internally fabricating a power supply of basically the same design, but with enhanced components. The licensee then planned on replacing all 120 power

that a MSSV must be declared inoperable if the valve body insulation is removed. The inspector confirmed that these actions had been taken.

In audition, as a result of the violation, the licensee committed to perform an audit of a sample of Licensee Event Reports (LERs) issued between 1990 and 1993 to verify that the indicated corrective actions were completed. The inspector noted that the audit was in progress during the inspection period and due to be completed in February 1994. The inspector considered that the licensee's corrective actions were adequate.

8 FOLLOWUP (92701)

8.1 (Closed) Unresolved Item 361/93-11-09: Acoustic Monitor Brackets Configuration Control

This item involved the licensee discovery that brackets to support the mounting of circuitry drawers for the Unit 2 pressurizer relief acoustic monitors had been left off. The licensee installed the necessary brackets on June 3, 1993. The inspector noted that it appeared that the licensee had issued a Site Problem Report (SPR) over a year earlier on this issue, but that it had not been elevated to a Nonconformance Report (NCR). The brackets were necessary for seismic support of the circuitry drawer.

The inspector reviewed Division Investigation Report DIR-NC-93-02, "Seismic Supports for Pressurizer Valve Acoustic Monitors," approved on October 26, 1993, and visually inspected the circuitry drawers.

The inspector concluded that during the construction phase of Units 2 and 3 rear mounting brackets to the circuitry drawers for the pressurizer acoustic monitors were not installed. The vendor recommended installation of these rear mounting brackets in order to seismically qualify the circuitry. The inspector also determined that an instrument and controls technician initiated SPR 900297 in March 1990 that related to this problem. This SPR noted that the rack assemblies and monitor modules (TEC1414-5 and 914) for both Units did not appear to be mounted properly and recommended installing linear slide tracks to more securely mount the circuitry and provide for easier access for maintenance. This SPR was later assigned a "plant betterment" priority. On May 27, 1993, this SPR was investigated by the licensee, and NCRs 93050070 and 93050078 were initiated.

The inspector concluded that the omission of the brackets during the construction phase was due to a failure by the licensee to modify the already installed circuitry after the vendor's seismic report was issued. The inspector noted that the managers of Nuclear Construction and Nuclear Design were instituting procedural requirements to ensure that final installation of equipment was performed in accordance with seismic qualification reports for any future equipment installation and were reviewing the process associated with receipt and tracking of vendor supplied documents. The inspector considered these actions adequate.

The inspector concluded that the failure to recognize that the SPR generated in March 1990 represented a nonconformance was due to personnel error on the

supplies with this enhanced board. The licensee estimated that the changeout would begin in March 1994 and be completed by September 1994.

The inspector determined that, in accordance with the licensee's program, capacitors used in safety-grade applications and with anticipated time periods for failure, were routinely replaced. These capacitors were are in systems including the process instrumentation system, engineered safety features actuation system, and the plant protection system.

The inspector concluded that the licensee had taken adequate action to identify the cause of the partial loss of annunciators and was in progress of taking adequate corrective actions. The inspector concluded that the licensee's program for preventing failures of capacitors used in safety grade applications appeared adequate.

8.3 (Closed) Unresolved Item 361/93-38-03: Containment Emergency Sump Design Expectations

This item involved the licensee's discovery that the top cover plates for the Units 2 and 3 containment emergency sumps had gaps between the plate and piping penetrations, gaps between the individual plates, and finger holes. These gaps provided paths that particles greater than 0.090 inches (the size of a particle that could have clogged a fuel channel opening) and greater than 0.25 inches (the size of a particle that could have clogged a containment spray nozzle) could have entered the sump.

The inspector participated in telephone discussions with Region V and the Office of Nuclear Reactor Regulation to review design expectations for the containment emergency sumps during the Unit's construction time frame. The inspector concluded, based on these discussions, that the "as-found" construction of the sumps, with gaps in the cover plates, was not the design anticipated by the NRC reviewers of the Final Safety Analysis Report (FSAR) when the sump design was approved by the NRC staff. The Updated Final Safety Analysis Report describes that "a solid top deck is provided to cover the emergency sump" and describes the mesh sizing to preclude passing particles which could clog fuel channel opening or containment spray nozzles. This conclusion was partially based on the NRC's Safety Evaluation Report, issued in February 1981. Based on this, the inspector considered this a violation of Criterion III of 10 CFR Part 50, Appendix B, "Design Control," which requires that measures shall be established to assure that the design basis for structures and systems important for safety are correctly translated into specifications and drawings. However, the inspector also concluded that the construction of the sumps with gaps in the top cover plates was of low safety significance. This was because of the anticipated low water flow rates in the area of the sumps, the construction of the systems in containment, and the cleanliness controls of the containment. Due to the low safety significance of this occurrence, and the fact that it was licensee identified, and prompt action was taken to seal the cover plates, the inspector concluded that the criteria of Section VII.B.(2) of the Enforcement Policy were met and this violation was not cited (NCV 50-361/94-02-03).

8.4 (Closed) Unresolved Item 362/93-29-01: Inadequate Analysis of Design Basis Flooding

This item involved an apparent failure to perform an adequate safety evaluation prior to commencing pre-outage work in the Unit 3 safety equipment building prior to the Unit 3 Cycle VII refueling outage. The safety analysis was inadequate because it failed to consider the impact of the removal of watertight floor plugs and the opening of doors and on design basis flooding accidents. The inspector considered that an underlying reason for the condition was an inadequate program to control watertight doors and plugs in the context of their role to prevent flooding, and the ensuing lack of procedural guidance.

The inspector reviewed LER 50-361/93-009, dated November 24, 1993, which described the occurrence involving inadequate control of watertight doors; a letter from R. M. Rosenblum to B. H. Faulkenberry, dated December 23, 1993, which provided a safety significance evaluation; and LER 50-361/93-009-01, dated January 4, 1994, which provided additional information concerning the safety significance of the event. Based on this review and observations in the Unit 3 safety equipment building, the inspector considered that the failure to perform an adequate safety analysis prior to removing a watertight floor plug leading to the shutdown cooling tunnel on September 13, 1993, was a violation of 10 CFR 50.59. This was because the combination of this plug being removed and the doors to rooms 2 and 5 being blocked open was a change to the facility as described in the UFSAR.

The UFSAR, Section 3.4.1.2.1.A, states that the design of San Onofre Units 2 and 3 ensures that "Failure of any non-Seismic Category I equipment, such as portions of the circulating water system, will not cause flooding..to a degree that would prevent engineered saftey systems from performing their safety functions." In addition, UFSAR, Section 3.4.1.2.2.A, states that "Redundant safety-related components are either located in separate compartments, are protected from flooding by adequate separation or are protected from flooding by natural drainage."

10 CFR 50.59 states that before a change to the facility as described in the UFSAR may be made, a written safety analysis is to be performed to assess whether the change represents an unreviewed safety question. The inspector concluded that the licensee had failed to perform an adequate safety analysis for a flooding event prior to removing the plug and blocking open doors to the rooms containing both trains of the emergency core cooling system (Violation 50-361/94-02-04).

The inspector noted that the potential safety consequences were not identified by the licensee until questions were raised by the NRC inspectors. The inspectors were initially given assurances by plant management that the work was being controlled and had been adequately reviewed prior to the start of the work. In addition, licensee managers stated that the Quality Assurance department had reviewed the specific work activities and had not identified any significant concerns related to the overall control of work. It appears that because the control of watertight doors and plugs was not under an

existing program, licensee personnel did not consider the implications of having these barriers breached.

Based on the inspector's subsequent questions, the licensee identified that certain design bases flooding assumptions had been violated. The inspectors considered that the safety significance of the occurrence was low because operators would have sufficient time to respond to this event prior to any damage to Emergency Core Cooling System pumps by stopping main circulating water pumps. In addition, the inspector noted that the design basis flood event of concern is a major rupture of the condenser/circulating water piping joint and that seals existed around the salt water cooling piping as it entered the safety equipment building. These seals were assumed to pass water freely in the UFSAR analysis, but were, in fact, intact and would have probably slowed, if not stopped, water flow. The inspector also considered that the licensee had taken prompt corrective action at the time of occurrence and had implemented adequate interim controls to prevent recurrence. The inspector also noted that the licensee planned to implement a permanent program to control watertight barriers. The inspector will monitor control of watertight doors during the course of normal inspection activities.

This review closes LERs 50-361/93-009, Revisions 0 and 1.

8.5 (Closed) Unresolved Item (50-361/93-11-10): Containment Equipment Hatch Unable to Close

On June 15, 1993, the licensee attempted to close the Unit 2 containment equipment hatch during preparations for core alterations. However, the hatch could not be closed because there was no electric power available to the hatch hoists. Licensee personnel found that the local switch box was open and a temporary cable had been installed through the switch box door. The open box had an interlock which prevented shutting the switch with the door open. Approximately 2.3 hours after starting the evolution, the interlock was defeated, the switch was closed, and the containment equipment hatch was closed.

Maintenance Division Experience Report (MDER) 93-010 was written as a result of this occurrence. The MDER indicated that the personnel involved did not have all of the key information pertaining to the power circuit, that the procedure for shutting the equipment hatch did not have a verification that power was available prior to starting closure, and that inadequate communication occurred between groups that were involved in the temporary cable installation.

Completed and proposed corrective actions for this event included procedure changes to verify power was available prior to shutting the containment equipment hatch, procedure changes for operating a breaker/disconnect switch in a temporary configuration, and training on electrical power supplies for refueling equipment. This item is closed based on the licensee's completed and proposed corrective actions.

9 IN-OFFICE REVIEW OF LICENSEE EVENT REPORTS (90712)

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

- 361/93-010, Revision 0: Configuration of Containment Sump Cover Plate
- 362/93-002, Revision 0: Missed Daily Technical Specification Surveillance
- 362/93-004, Revision 0: Reactor Trip Due to Loss of Condenser Vacuum
- 362/93-005, Revision 0: Component Cooling Water Valve Incorrectly Assembled
- 362/93-006, Revision 0: Reactor Protection Actuation During Mode 3 (Reactor Coolant Pump Failure)

ATTACHMENT 1

1 PERSONS CONTACTED

1.1 Licensee Personnel

*D. Breig,	Manager, Station Technical
L. Cash,	Maintenance Manager
C. Chiu,	Manager, Quality Engineering
*R. Douglas,	Licensing Engineer, Onsite Nuclear Licensing
*J. Fee,	Health Physics Assistant Manager
V. Fisher,	Assistant Operations Manager
*G. Gibson,	Supervisor, Onsite Nuclear Licensing
*S. Giannell,	Engineer, Fire Protection
*R. Giroux,	Licensing Engineer, Onsite Nuclear Licensing
*D. Herbst,	Manager, Quality Assurance
*D. Irvine,	Supervisor, Technical Support
*R. Joyce,	Maintenance Manager, Units 2/3
B. Katz,	Manager, Nuclear Oversight
P. Knapp,	Manager, Health Physics
T. Krieger,	Vice President, Nuclear Generating Station
*J. Madigan,	Supervisor, Health Physics
H. Newton,	Manager, Site Support Services
H. Ray,	Senior Vice President, Power Systems
J. Reeder,	Manager, Nuclear Training
J. Reilly,	Manager, Nuclear Engineering & Construction
*M. Robinson,	Licensing Engineer, Onsite Nuclear Licensing
R. Rosenblum,	Vice President, Nuclear Engineering and Technical Support
M. Short,	Manager, Site Technical Services
*K. Slagle,	Manager, Outage Management
*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

*R. Erickson,	Site Representative, San Diego Gas and Electric

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 February 1, 1994. 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

CMOS	complementary metal oxide semiconductor
HPSI	high pressure safety injection
LER	Licensee Event Report
M&TE	measuring and testing equipment
MO	Maintenance Order
MSSV	main steam safety valve
NCR	Nonconformance Report
PPS	plant protection system
RCP	reactor coolant pump
REP	radiation exposure permit
SFP	spent fuel pool
SPR	Site Problem Report
UFSAR	Updated Final Safety Analysis Report