

ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.: 50-528
50-529
50-530

License Nos.: NPF-41
NPF-51
NPF-74

Report No.: 50-528/97-14
50-529/97-14
50-530/97-14

Licensee: Arizona Public Service Company

Facility: Palo Verde Nuclear Generating Station, Units 1, 2, and 3

Location: 5951 S. Wintersburg Road
Tonopah, Arizona

Dates: June 15 through July 26, 1997

Inspectors: Francis Brush, Acting Senior Resident Inspector
Dan Carter, Resident Inspector
Nancy Salgado, Resident Inspector
Brad Olson, Project Engineer

Approved By: Dennis F. Kirsch, Chief, Reactor Projects, Branch F

Attachment: Supplemental Information

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EXECUTIVE SUMMARY

Palo Verde Nuclear Generating Station, Units 1, 2, and 3
NRC Inspection Report 50-528/97-14; 50-529/97-14; 50-530/97-14

Operations

- The inspectors observed good performance by operations personnel during Unit 3 power changes (Section O1.1).
- Unit 1 operators opened drain valves on low pressure safety injection system A rendering it inoperable as a result of erroneous instructions provided by a control room supervisor who exercised insufficient attention to detail. This was a noncited violation for failure to follow procedures (Section O4.1).
- A less than adequate level of attention to detail was exercised by Unit 3 operators on bypassing the reactor protection system low steam generator level signals instead of the required engineered safety features level signals. This was a noncited violation of Technical Specifications. A contributor to the event was inadequate labeling of the bypass switches (Section O4.2).

Maintenance

- The licensee's response to the Unit 1 plant protection system Channel B dual power supply failure was good (Section M2.1).

Engineering

- The licensee's response to inspector concerns on potential flooding in the remote shutdown panel rooms dealt with fire protection system actuation caused flooding and did not adequately address the issue of essential chilled water induced flooding. The licensee was performing additional reviews to determine the effects of an essential chilled water piping line break on the remote shutdown capability (Section E2.1).
- The licensee discovered an error in the fuel vendor's energy redistribution factor used in the loss-of-coolant accident (LOCA) analysis. The inspectors concluded that this represented good technical work and thoroughness in their approach to updating the Safety Analysis Basis Document (Section E4.1).
- The licensee documented in Licensee Event Report (LER) 50-528/95-010-01 that the Unit 1 air handling unit motor for the Train A essential cooling water pump room would not remain operable during a high energy line break. The inspectors verified that the corrective actions for the LER were complete. This licensee identified and corrected violation was a noncited violation (Section O4.2).



Report Details

Summary of Plant Status

Units 1 and 2 operated at essentially 100 percent power for the duration of the inspection period.

Unit 3 began this inspection period at 100 percent power. On July 2, the unit decreased power to 85 percent to allow for repairs of a packing leak on the heater drain Tank B level control valve. The unit returned to full power the following day. On July 5, the unit decreased power to 85 percent power to allow for repair of a leak on the heater drain Tank B manway. The unit returned to 100 percent power the following day and remained there for the duration of the inspection period.

I. Operations

O1 Conduct of Operations

O1.1 Observation of Control Room Activities (Unit 3)

a. Inspection Scope (71707)

On July 2 and 3, 1997, the inspectors observed control room activities during Unit 3 power changes.

b. Observations and Findings

Control room operations personnel exhibited good communications within the control room and with operators in the plant. Shift management personnel conducted thorough preevolution briefings. The shift supervisor demonstrated good oversight of the activities in progress. Operators practiced self checking when operating equipment. The power changes were conducted in accordance with established requirements.

c. Conclusions

The inspectors concluded that operator performance was good during the power changes.

O4 Operator Knowledge and Performance

O4.1 Low Pressure Safety Injection (LPSI) System Train A Inadvertently Removed From Service (Unit 1)

a. Inspection Scope (71707)

The licensee inadvertently removed the Unit 1 LPSI system Train A from service... The inspectors examined the licensee's response and corrective actions to the event and reviewed Condition Report/Disposition Request (CRDR) 1-7-0175, and



Procedure 73ST-9SI11, "LPSI Pumps Miniflow - Inservice Test," Revision 4. The inspectors also discussed the event with licensee personnel.

b. Observations and Findings

On June 11, 1997, the licensee recirculated the water in the refueling water tank using LPSI Pump A. During the evolution, the LPSI Pump B discharge header was pressurized. The header was pressurized due to a small leak through a manual isolation valve in the Pump B full flow recirculation piping. Both LPSI pumps have a common full flow return line to the refueling water tank. After Pump A was secured, the Pump B discharge header remained pressurized.

On June 15, 1997, the licensee attempted to depressurize the Pump B header using Procedure 73ST-9SI11, Attachment A, Revision 4. The attachment listed instructions for depressurizing both the Pump A and B discharge headers. Following a control room briefing, operations shift management assigned an auxiliary operator (AO) to perform the required valve manipulations.

The control room supervisor (CRS) inadvertently instructed the AO to manipulate the incorrect valve. Procedure 73ST-9SI11, Appendix A, step 3.0, stated that manual Valves SIE-V464 and SIE-V298 were to be opened to relieve pressure on the Pump B discharge piping. However, the AO was told, in error, to open Valves SIE-V460 and SIE-V298.

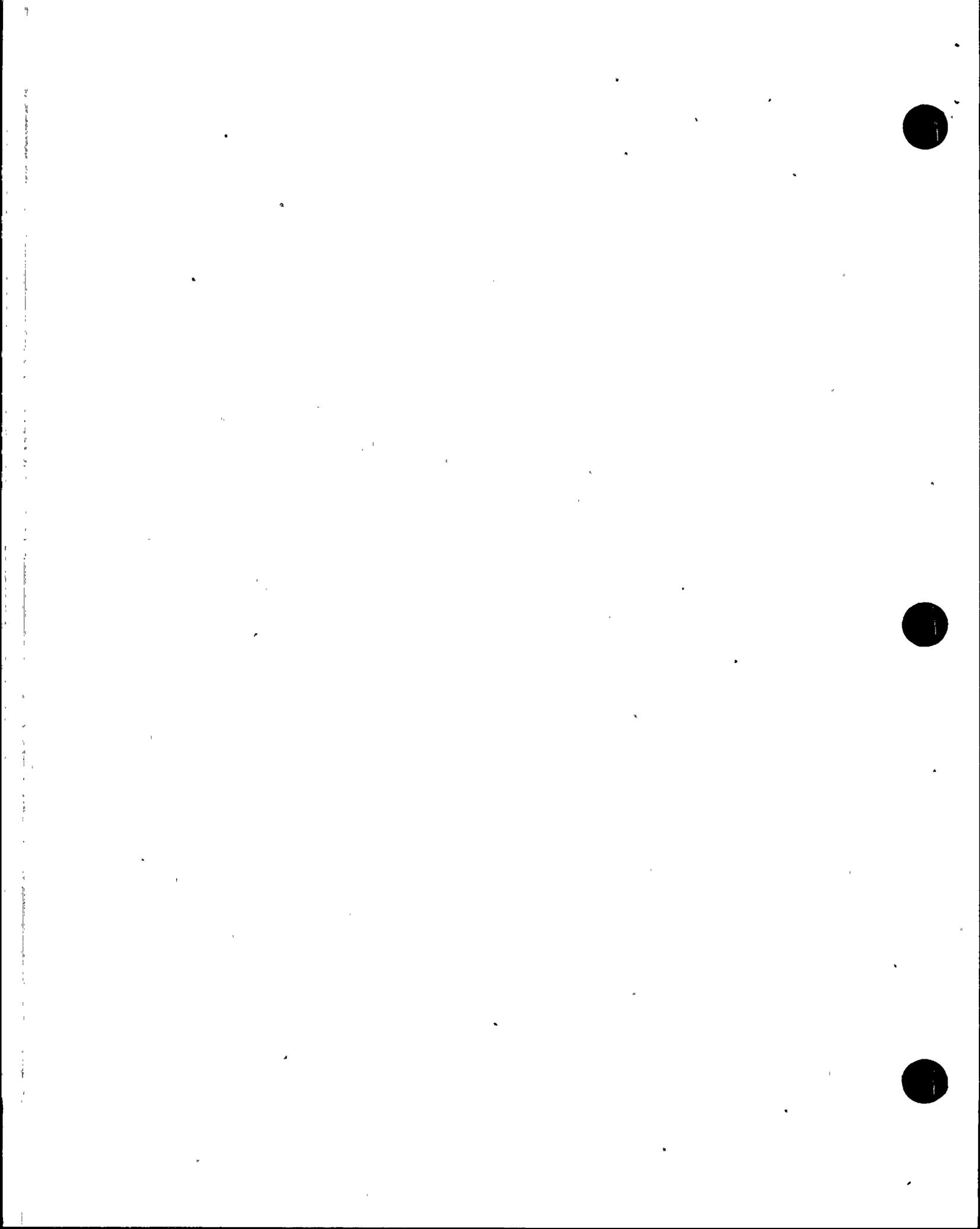
Control room operations personnel observed that the pressure in the Pump B line did not decrease after the AO opened the valves. Control room personnel then realized that the AO had been erroneously instructed to open the valves for the Pump A discharge piping. This rendered the LPSI Pump A system inoperable.

Control room operators (CRO) immediately directed the AO to close the valves. The AO immediately closed the Pump A valves which returned the system to an operable status. The AO then opened the Pump B valves and depressurized the associated discharge piping. Although the LPSI A system was inoperable for about thirty seconds, the system was still available. The AO had remained in the area which minimized the affect on plant safety.

The licensee initiated CRDR 1-7-0175 to document the event. Operations management counseled the operations shift personnel regarding importance of attention to detail and the licensee performed a root cause evaluation of the event which concluded that the event was caused by personnel error.

c. Conclusions

The failure to open the correct valves to depressurize the LPSI Pump B discharge piping was a violation of Technical Specification (TS) 6.8.1 and Procedure 73ST-9SI11. The licensee failed to follow procedure, thereby rendering



the LPSI A train inoperable for about thirty seconds. This event had minimal safety significance. This nonrepetitive, licensee-identified and corrected violation is being treated as a noncited violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (NCV 50-528/97-14-01).

04.2 Incorrect Parameters In Number 2 Steam Generator Channel A Plant Protection System Placed In Bypass Due To Operator Error (Unit 3)

a. Inspection Scope (71707)

Unit 3 operations personnel incorrectly placed two steam generator level parameters in Channel A in bypass. The inspectors examined the licensee's response and corrective actions to the event and reviewed CRDR 3-7-0285, TS Tables 3.3-1 and 3.3-3, and CRO Logs. The inspectors also discussed the event with licensee personnel.

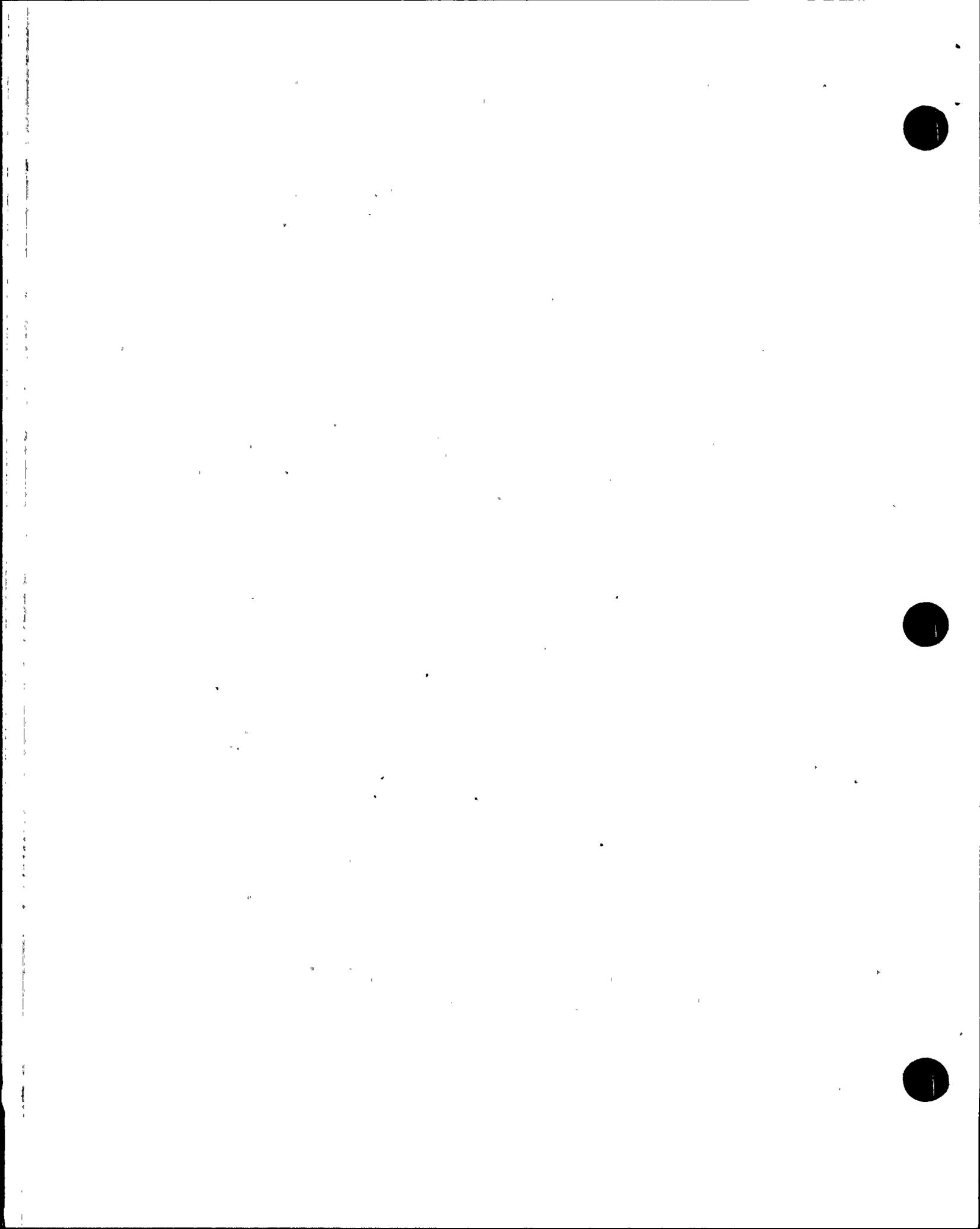
b. Observations and Findings

On June 15, 1997, while checking the deviation between pressure channels on steam generator two, a CRO observed that the difference between Channel A and the highest reading channel was 48 pounds per square inch. There are four pressure channels per steam generator. The TS acceptance criteria for the maximum difference between channels is less than or equal to 50 pounds per square inch. The licensee conservatively declared the A channel inoperable.

TS Sections 3.3.1, Action 2, and 3.3.2, Action 13, require that the associated reactor protection system (RPS) and engineered safeguard features (ESF) parameters in the plant protection system (PPS) be placed in bypass within 1 hour. At 8:20 a.m. on June 15, 1997, an operator bypassed the RPS low steam generator pressure parameter. However, the operator inadvertently bypassed the RPS low steam generator levels, instead of the ESF level parameters.

At approximately 7 p.m., following shift turnover, the oncoming CRS questioned which parameters should be bypassed. After reviewing the applicable TS sections, the CRS determined that the incorrect parameters had been bypassed. At 7:17 p.m., operators placed the RPS low steam generator levels in service and bypassed the ESF low steam generator levels.

The inspectors observed that the ESF and RPS bypass switches were identically labeled. This confusing labeling and an insufficient attention to detail by operations personnel contributed to the error. The licensee initiated CRDR 3-7-0285 to document the event and identify corrective actions. Operations management strongly counseled the control room staff regarding the importance of attention to detail. The licensee performed a root cause evaluation of the event and determined that this event was primarily due to personnel error.



c. Conclusions

The operators bypassed incorrect parameters in the PPS due to personnel error. The inspector concluded that since Technical Specification limits were never exceeded there was no adverse effect on plant safety. 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 (NCV 50-530/97-14-02).

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments on Maintenance Activities

a. Inspection Scope (62707)

The inspectors observed all or portions of the following work activities:

WO 792395: Inspect Generator Brushes, B Emergency Diesel Generator
WO 800032: Replace Cam Cover Gasket, B Emergency Diesel Generator
WO 750011: Inspect/Adjust 4.16 kv Circuit Breakers
WO 801221: Remove Motor on Spray Pond Valve 3JSPAHV0049A
WO 771017: Install Charging Pump Modifications
WO 779479: Perform 6-Month Inspection of Charging Pump

b. Observations and Findings

The inspectors found the work performed under these activities to be professional and thorough. All work observed was performed with the work package present and in active use. Technicians were experienced and knowledgeable of their assigned tasks.

M1.2 General Comments on Surveillance Activities

a. Inspection Scope (61726)

The inspectors observed portions of Surveillance Activity 32ST-9ZZ34, Battery Charger Surveillance.

b. Observations and Findings

The inspectors found this surveillance was performed acceptably and as specified by the applicable procedure.



M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 PPS Power Supply Failures (Unit 1)

a. Inspection Scope (62707)

On June 24, 1997, Unit 1 experienced pretrips and trip signals on all parameters for Channel B of the PPS. Operations personnel observed that two power supply lamps (PS-2 and PS-4) and a ground fault lamp for PPS B were extinguished. The inspectors reviewed the effects of the trip signals on the PPS, discussed the event with control room operations personnel, and observed instrumentation and control (I&C) troubleshooting activities.

b. Observations and Findings

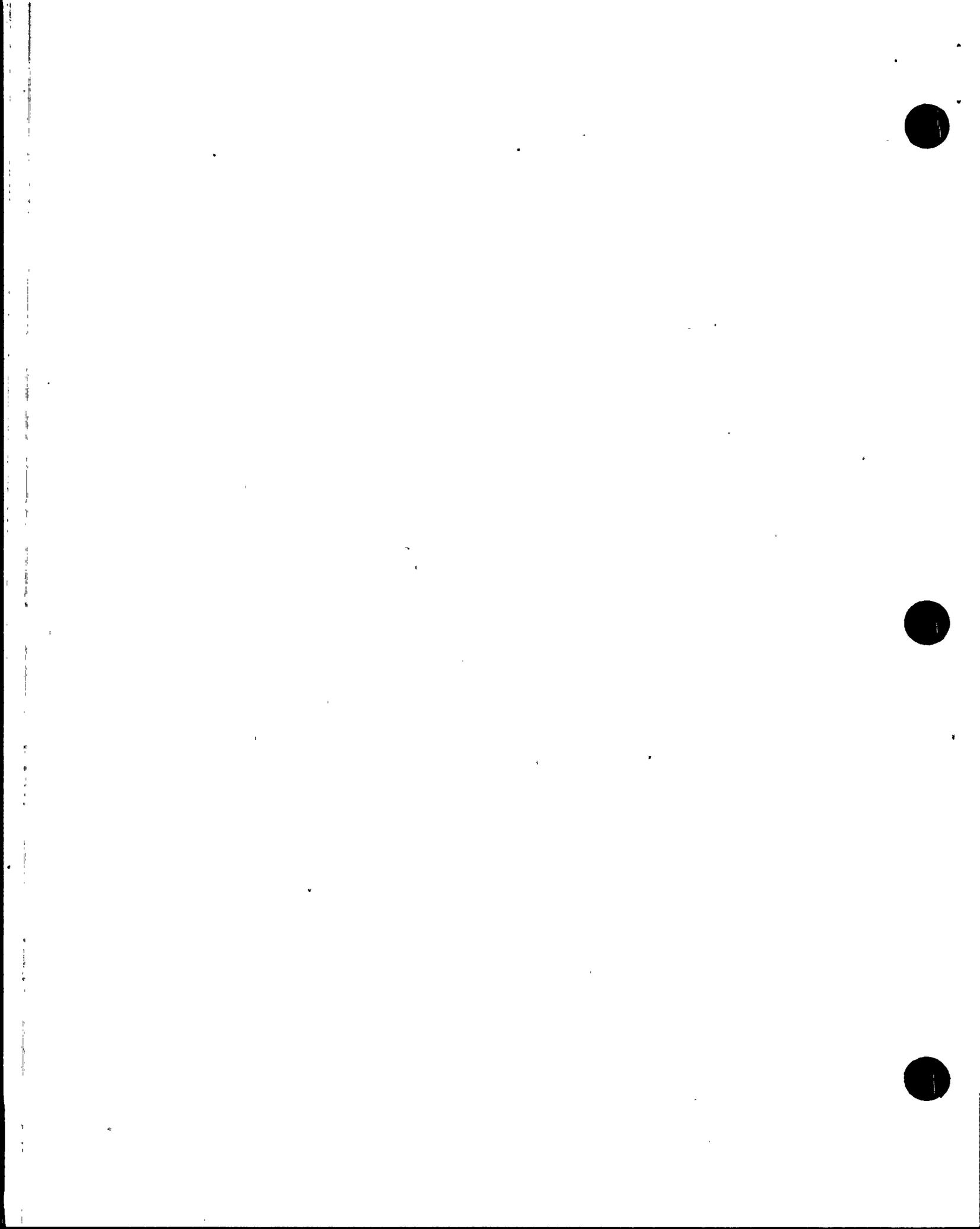
The inspectors reviewed the actions performed by the CROs in response to the pretrip and trip signals on Channel B of PPS. All annunciator response procedures were properly followed. The control room staff placed the affected parameters in bypass as required by TS. The Channel B PPS cabinet was quarantined awaiting I&C troubleshooting and repair activities.

I&C personnel were notified and developed an action plan to determine and correct the cause of the power supply failures. The inspectors reviewed the action plan and observed the troubleshooting activities. During the activities, the I&C technicians wanted to deviate from the plan to perform additional troubleshooting activities. The I&C supervisor stopped work, modified the plan, and discussed the changes with the CRS. This demonstrated a well thought out approach to changing established requirements and the implementation of management expectations.

The licensee determined that both power supplies to the Channel B PPS were in a degraded condition. However, the voltage did not drop below the alarm setpoint to alert control room personnel. The licensee initiated CRDR 1-7-0183 to determine the root cause and transportability of the event.

c. Conclusions

The inspectors concluded that licensee's response to the Unit 1 channel B PPS power supply failures was good. I&C personnel troubleshooting activities were performed in a detailed and professional manner. CROs properly followed annunciator response procedures.



III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Remote Shutdown Panel Room B Flooding/Water Spray Concern

a. Inspection Scope (37551)

The inspectors observed that essential chilled water (ECW) piping and valves were located in the remote shutdown Panel B room for each unit. The inspectors also observed that there was no floor drain in the room to remove water in the event of a pipe break or valve leakage and that there was a potential for water to spray into the panels. The inspectors discussed these concerns with the licensee.

b. Observations and Findings

The licensee's response stated that there were no flooding or water spray concerns in the remote shutdown panel rooms. The water level in the room, in the case of flooding, would not reach any electrical wiring connections. Also, any water spray from the ECW system would not short out any panel and cause a failure or reactor trip. The response was based on the following calculations:

- 13-MC-ZJ-200 Control Building Flooding Calculation
- 13-MC-ZZ-642 Moderate Energy Crack Evaluation.

After reviewing the calculations, the inspectors had concerns with the licensee's response in the following areas:

- The maximum water level in the room, and
- The potential effect of water spray on the panels.

The flooding calculation stated, in part, that the potential maximum water level was within 0.3 inches of a wiring connection 30 minutes after an ECW pipe break. However, the maximum span of time between room tours could be 2 hours. This could have allowed water to reach the electrical connections. Additionally, the ECW system had an automatic makeup feature which would make detection of a system leak difficult.

The justification, in Calculation 13-MC-ZZ-642, that water spray would not affect the panels was based on a fire suppression sprinkler actuation and the fact that the panels' vent louvers pointed down. Although there was no sprinkler system in the room, the ECW piping was at and below the level of the louvers. This could allow spray from an ECW system pipe break to enter the panels and affect remote shutdown Panel B.



Based on the information provided by the inspectors, the licensee was conducting further reviews on the potential flooding and water spray concerns in the remote shutdown panel rooms.

c. Conclusions

The inspectors concluded that the licensee's evaluation and response to the flooding concerns was not adequate. The inspectors will review the licensee's response to the issue in a future inspection report. This is an inspection followup item (IFI 50-528,529,530/97-14-03).

E4 Engineering Staff Knowledge and Performance

E4.1 Error in the Energy Redistribution Factor Used in Fuel Vendor's LOCA Analysis

a. Inspection Scope (37551)

The inspectors reviewed the fuel vendor's 10CFR Part 21 report and discussed the issue with licensee personnel.

b. Observations and Findings

The licensee determined that there was a problem with the use of the energy redistribution factors (ERF) used in the core physics inputs to the LOCA analysis. The licensee identified the problem during development of the safety analysis basis document for the LOCA analysis. The ERF represents the fraction of the total energy generated by a fuel rod which is actually deposited in the rod. The current ERF values were calculated in the 1970s.

The licensee reported the potential problem to the fuel vendor. The vendor then issued a 10CFR Part 21 notice. The error was nonconservative and affected the calculated peak clad temperature in the LOCA analysis. The licensee reduced the fuel linear heat generation rate upper limit by 0.2 kilowatts per foot as recommended by the vendor. This provided additional safety margin to account for the ERF error. The licensee determined that no fuel operating limits have been exceeded as a result of the error.

c. Conclusions

The inspectors concluded that the discovery of the error by the licensee demonstrated good engineering and technical work and an in-depth and conscientious review of the LOCA analysis.



E8 Miscellaneous Engineering Issues

E8.1 (Closed) LER 50-528/95-010-01: Equipment Qualification Of Air Handling Unit Causes ECW Pump To Become Inoperable.

On July 27, 1995, the licensee identified that the Unit 1 air handling unit (AHU) motor for the Train A Essential Cooling Water (EW) pump room would not remain operable during a high energy line break (HELB). During a HELB, the Raychem splice in the motor lead connection box would be submerged. The EW pump was declared inoperable due to the inoperable essential AHU motor. This resulted in the Train A high pressure safety injection, LPSI, containment spray, and auxiliary feedwater pumps, and control room essential filtration becoming inoperable. There were no component or system failures involved in this event. On July 27, weep holes were drilled in the AHUs motor lead connection boxes on all three units to prevent excessive accumulation of moisture, and the EW pumps were declared operable.

The licensee identified an additional 58 components that needed corrective actions to prevent moisture accumulation from submerging components. The inspector reviewed completed maintenance work packages and verified that the corrective action was complete.

This nonrepetitive, licensee-identified and corrected violation is being treated as a noncited violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (NCV 50-528,529,530/97-14-04).

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

R1.1 General Comments (71750)

The inspectors observed radiation protection personnel, including supervisors, routinely touring the radiologically controlled areas. Licensee personnel working in radiologically controlled areas exhibited good radiation work practices.

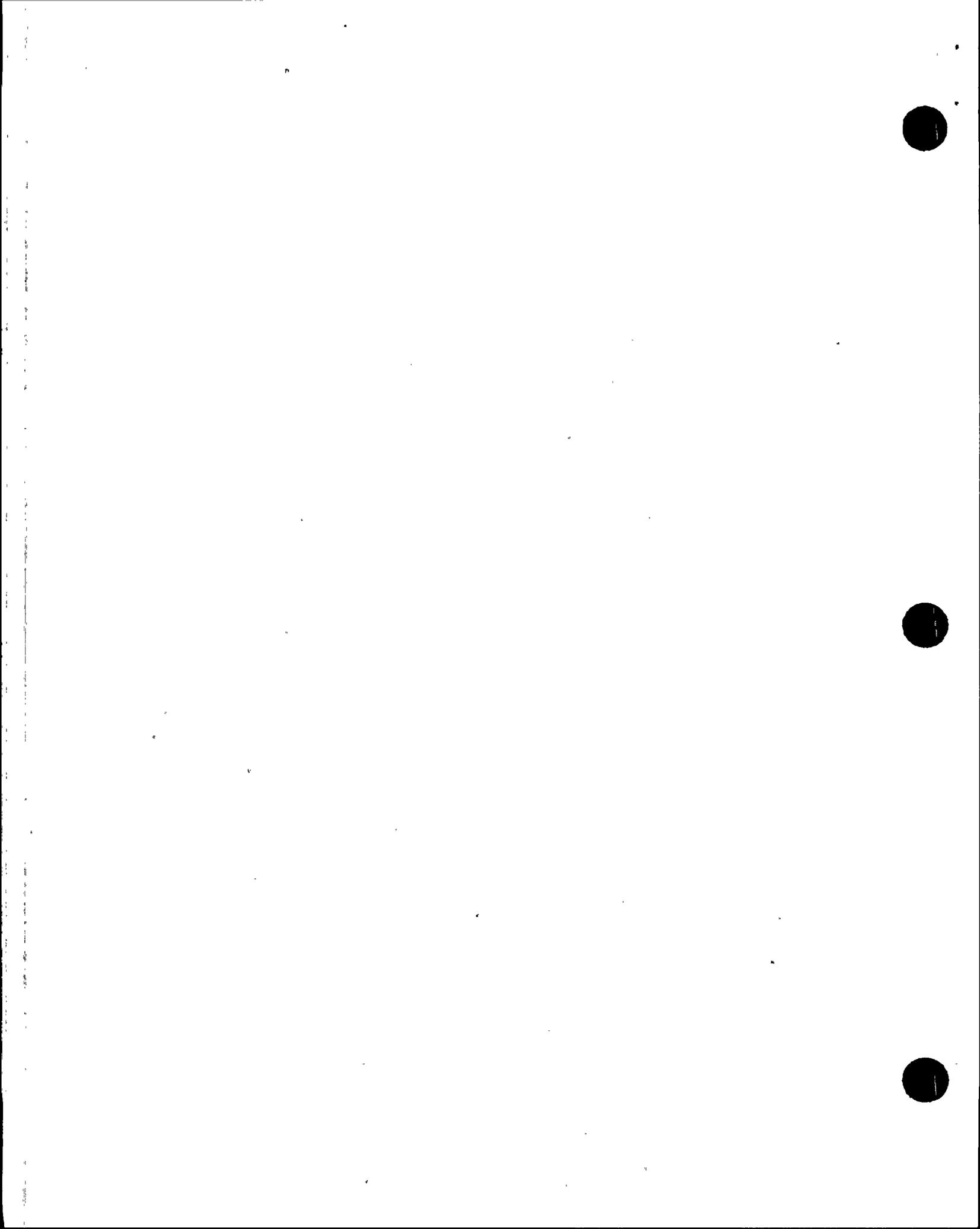
Contaminated areas and high radiation areas were properly posted. Area surveys posted outside rooms were current. The inspectors checked a sample of doors, required to be locked for the purpose of radiation protection, and all were in accordance with requirements.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on July 23, 1997. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any material examined during the inspection should be considered proprietary. No proprietary information was identified.



ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

Licensee

- R. Fullmer, Director, Nuclear Assurance
- F. Gowers, Site Rep., EPE
- R. Henry, Site Rep., Salt River Project
- W. Ide, Vice President, Nuclear Engineering
- D. Kanitz, Engineer, Nuclear Regulatory Affairs
- A. Krainik, Department Leader, Nuclear Regulatory Affairs
- D. Marks, Section Leader, Nuclear Regulatory Affairs
- D. Mauldin, Director, Maintenance
- B. Rash, Department Leader, System Engineering
- J. Taylor, Unit 3 Operations Department Leader
- C. Zell, Department Leader, Operations

INSPECTION PROCEDURES USED

37551	Onsite Engineering
61726	Surveillance Observations
62707	Maintenance Observation
71707	Plant Operations
71750	Plant Support Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-528; 50-529; 50-530/9714-01	NCV	the failure to open the correct valves to depressurize the LPSI Pump B discharge piping
50-528; 50-529; 50-530/9714-02	NCV	operators bypassed incorrect parameters in the PPS due to personnel error
50-528; 50-529; 50-530/9714-03	IFI	the inspectors concluded that the licensee's evaluation and response to the flooding concerns was not adequate
50-528; 50-529; 50-530/9714-04	NCV	licensee identified additional 58 components that needed corrective actions to prevent moisture accumulation from submerging components

Closed

50-528; 50-529; 50-530/9714-01	NCV	the failure to open the correct valves to depressurize the LPSI pump B discharge piping
50-528; 50-529; 50-530/9714-02	NCV	operators bypassed incorrect parameters in the PPS due to personnel error
50-528; 50-529; 50-530/9714-04	NCV	licensee identified additional 58 components that needed corrective actions to prevent moisture accumulation from submerging components
50-528/95-010-01	LER	equipment qualification of air handling unit causes EW pump to become inoperable



LIST OF ACRONYMS USED

AHU	air handling unit
AO	auxiliary operator
CRDR	Condition Report/Disposition Request
CRO	control room operator
CRS	control room supervisor
ECW	essential chilled water
ERF	energy redistribution factors
ESF	engineered safeguard features
EW	essential cooling water
HELB	high energy line break
I&C	instrumentation and control
LER	Licensee Event Report
LOCA	loss-of-coolant accident
LPSI	low pressure safety injection
PPS	plant protection system
RPS	reactor protection system
TS	Technical Specifications

