UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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ARLINGTON, TEXAS 76011-8064

September 4, 2002

Gregg R. Overbeck, Senior Vice
President, Nuclear
Arizona Public Service Company
P.O. Box 52034
Phoenix, Arizona 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION - NRC INTEGRATED INSPECTION REPORT 50-528/02-07; 50-529/02-07; 50-530/02-07

Dear Mr. Overbeck:

On August 16, 2002, the NRC completed an inspection at your Palo Verde Nuclear Generating Station. The enclosed report documents the inspection findings, which were discussed on August 16, 2002, with you and other members of your staff.

This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel.

On the basis of the results of this inspection, no findings of significance were identified.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

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Engineering and Maintenance Branch
Division of Reactor Safety

Dockets: 50-528; 50-529; 50-530
Licenses: NPF-41; NPF-51; NPF-74

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Dockets:	50-528; 50-529; 50-530
Licenses:	NPF-41; NPF-51; NPF-74
Report No:	50-528/02-07; 50-529/02-07; 50-530/02-07
Licensee:	Arizona Public Service Company
Facility:	Palo Verde Nuclear Generating Station, Units 1, 2, and 3
Location:	5951 S. Wintersburg Road Tonopah, Arizona
Dates:	July 29 through August 16, 2002
Team Leader:	M. F. Runyan, Senior Reactor Inspector, Engineering Maintenance Branch
Inspectors:	P.A. Goldberg, Senior Reactor Inspector, Engineering Maintenance Branch
	W. M. McNeill, Senior Reactor Inspector, Engineering Maintenance Branch
	G. Miller, Reactor Inspector, Engineering Maintenance Branch
Accompanying Personnel:	J. Chiloyan, Beckman and Associates
	J. Diecker, Engineering Associate
	J. Wylam, Engineering Associate
	S. Rutenkroger, Engineering Associate
Approved By:	Charles S. Marschall, Chief Engineering Maintenance Branch Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000528-02-07, IR 05000529-02-07, IR 05000530-02-07, Arizona Public Service Company; 7/29/02 - 8/16/02, Palo Verde Nuclear Generating Station; Units 1, 2, and 3, regional team report.

The inspection was conducted by four regional inspectors and one contractor. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

No findings of significance were identified.

Report Details

1 **REACTOR SAFETY**

Introduction

A team inspection was performed to verify that facility safety system design and performance capability were adequate and that the initial design and subsequent modifications have preserved the current design basis of the systems selected for review. The scope of the review also included any necessary nonsafety-related structures, systems, and components that provided functions to support safety functions. The inspection effort also reviewed the licensee's programs and methods for monitoring the capability of the selected systems to perform the current design basis functions. This inspection verified aspects of the initiating events, mitigating systems, and barrier cornerstones.

The probabilistic risk assessment model for the Palo Verde Nuclear Generating Station is based on the capability of the as-built safety systems to perform their intended safety functions successfully. The area and scope of the inspection were determined by reviewing the licensee's probabilistic risk analysis models to identify the most risk significant systems, structures, and components according to their ranking and potential contribution to dominant accident sequences and/or initiators. Deterministic effort was also applied in the selection process by considering recent inspection history, recent problem area history, and all modifications developed and implemented.

The team reviewed in detail the 4.16 kV electrical distribution system, the high pressure safety injection system, the low pressure safety injection system, the safety injection tanks, and the charging system. The primary review prompted parallel review and examination of support systems, such as, electrical power, instrumentation, room cooling systems, and related structures and components.

The objective of this inspection was to assess the adequacy of calculations, analyses, engineering processes, and engineering and operating practices that were used to support the performance of the safety systems selected for review and the necessary support systems during normal, abnormal, and accident conditions. Acceptance criteria utilized by the NRC inspection team included NRC regulations, the technical specifications, applicable sections of the Final Safety Analysis Report, applicable industry codes and standards, as well as, industry initiatives implemented by the licensee's programs.

1R21 Safety System Design and Performance Capability (71111.21)

.1 System Requirements

a. Inspection Scope

The team reviewed the following attributes of the selected systems: (1) process medium (water, steam, and air), (2) energy sources, (3) control systems, and (4) equipment protection. The team verified that procedural instructions to operators were consistent with operator actions required to meet, prevent, and/or mitigate design basis accidents. The review also considered requirements and commitments identified in the

Final Safety Analysis Report, technical specifications, design basis documents, and plant drawings.

b. Findings

No findings of significance were identified.

.2 System Condition and Capability

a. Inspection Scope

The team reviewed the periodic testing procedures for the selected systems to verify that the design requirements were adequately demonstrated. The team reviewed the environmental qualification of a sample of system components to verify the capability to operate under design environmental conditions and the assumed operating parameters including: voltage, speed, power, flow, temperature, and pressure.

The team also reviewed the systems' operations by conducting system walkdowns; reviewing normal, abnormal, and emergency operating procedures; and reviewing the Final Safety Analysis Report, technical specifications, design calculations, drawings, and procedures.

b. Findings

No findings of significance were identified.

.3 Identification and Resolution of Problems

a. Inspection Scope

The team reviewed a sample of problems identified by the licensee in the corrective action program to evaluate the effectiveness of corrective actions related to design issues. The sample included open and closed condition reports for the past 3 years that identified issues affecting the selected systems.

b. Findings

No findings of significance were identified.

.4 System Walkdowns

a. Inspection Scope

The team performed walkdowns of the accessible portions of the selected systems. The walkdowns focused on the installation and configuration of power supplies, piping, components, and instruments. During the walkdowns, the team assessed:

- The placement of protective barriers and systems,

- The susceptibility to flooding, fire, or environmental conditions,
- The physical separation of trains and the provisions for seismic concerns,
- Accessibility and lighting for any required local operator action,
- The materiel condition and preservation of systems and equipment, and
- The conformance of the currently-installed system configurations to the design and licensing bases.

b. Findings

No findings of significance were identified.

.5 Design Review

a. Inspection Scope

The team reviewed the current as-built instrument and control, electrical, and mechanical design of the selected systems. These reviews included a review of design assumptions, calculations, required system thermal-hydraulic performance, electrical power system performance, protective relaying, and instrument setpoints and uncertainties. The team also performed a single-failure review of individual components to determine the effects of such failures on the capability of the systems to perform their design safety functions.

The team reviewed calculations, drawings, specifications, vendor documents, Final Safety Analysis Report, technical specifications, emergency operating procedures, and temporary and permanent modifications.

b. Findings

No findings of significance were identified.

.6 Safety System Inspection and Testing

a. Inspection Scope

The team reviewed the program and procedures for testing and inspecting components in the selected systems. The review included the results of surveillance tests required by the technical specifications.

b. Findings

No findings of significance were identified.

.4 OTHER ACTIVITIES (ZA)

4OA3 Event Followup (71153)

.1 (Closed) LER 05000529/2001-002-00: Logic Board and Pin Connector Failure Causes Three of Four Main Steam Isolation Valves to Close.

This report discussed an event in which a logic board failure in the main steam and feedwater isolation system cabinet caused three main steam isolation valves to shut, resulting in a reactor trip from approximately 100 percent power. The valves closed as a result of a fire in the main steam and feedwater isolation system cabinet. Additional details of this event are discussed in NRC Inspection Report 50-528, -529, -530/02-05.

The team reviewed the apparent cause of the event and the corrective actions detailed in Condition Report/Dispositions Request 2405660 and interviewed licensee engineers. No findings of significance were identified. This licensee event report is closed.

4OA6 Management Meetings

Exit Meeting Summary

The team leader presented the inspection results to Mr. G. Overbeck, Senior Vice President, Nuclear, and other members of licensee management at the conclusion of the onsite inspection on August 16, 2002.

At the conclusion of this meeting, the team leader asked the licensee's management whether any materials examined during the inspection should be considered proprietary. Some proprietary information was identified, but it was not discussed in the report.

ATTACHMENT

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H. Mortazavi, Design Engineer
P. Murphey, Senior Engineer, Mechanical Design
G. Overbeck, Senior Vice President, Nuclear
D. Vogt, Lead Shift Technical Advisor

NRC:

G. Warnick, Resident Inspector

ITEMS CLOSED

05000529/2001-002-00	LER	Logic Board and Pin Connector Failure Causes Three of Four Main Steam Isolation Valves to Close. (Section 4OA3)

Documents Reviewed:

CRDRs

35155	2340953	2404768	2440138	2493353
111467 (CRAI 113067)	2341398	2405660	2441255	2507393
117201	2345337	2406617	2448068	2508389
117493	2350799	2407845	2453561	2516093
118495	2359345	2415676	2459383	2516816
3-8-0336	2369750	2417254	2468293	2522080
3-9-0008	2381185	2427545	2470853	2529219
9-4-0096	2384134	2435085	2473816	2544757
971263	2390219	2436748	2481133	2546352
2303536	2392627	2437366	2490693	2548138
2307016	2404064	2438736	2492855	2548519

Procedures

EQDF EQ-PM, “Equipment Qualification Program Manual,” Revision 12

01-E-ZZ1-004, “Electrical Protection Data Base,” Revision 4

12DP-0MC46, “Receipt Inspection,” Revision 1

12DP-0MC48, “Quality Receiving Checklist Development,” Revision 1

32ST-9ZZ03, “Surveillance Test Procedure for the class 4160 Bus Undervoltage Protective Relays,” Revision 13

32MT-9ZZ06, “Testing and Calibration of the12IFC53A & 53Band the 77A & 77B Time overcurrent Relays,” Revision 4

32MT-9ZZ74, “Molded Case Circuit Breaker Test,” Revision 19

40DP-0OP02, “Relay Resetting,” Revision 7

40OP-9CH01, “CVCS Normal Operations,” Revision 18

40OP-9PG01, “480V Class 1E Switchgear,” Revision 10

40EP-9EO01, “Standard Post Trip Actions,” Revision 6

40EP-9EO02, “Reactor Trip,” Revision 3

40OP-9CH03, “Reactor Coolant Pump Seal Injection System,” Revision 13

40EP-9EO03, “Loss of Coolant Accident,” Revision 11

40EP-9EO04, “Steam Generator Tube Rupture,” Revision 13

40EP-9EO05, “Excess Steam Demand,” Revision 10

40EP-9EO06, “Loss of All Feedwater,” Revision 7

40ST-9SI07, “High Pressure Safety Injection System Alignment Verification,” Revision 6

40EP-9EO07, “Loss of Offsite Power/Loss of Forced Circulation,” Revision 8

40EP-9EO08, “Blackout,” Revision 3

40EP-9EO09, “Functional Recovery Procedure,” Revision 12

40EP-9EO10, “Standard Appendices,” Revision 24

40EP-9EO11, “Lower Mode Functional Recovery,” Revision 5

40AO-9ZZ12, “Degraded Electrical Power,” Revision 12

40DP-9OP19, “Locked Valve, Breaker, and Component Tracking,” Revision 62

40DP-9OP26, “Operability Determination,” Revision 11

73DP-0XI03, “Check Valve Predictive Maintenance and Monitoring Program,” Revision 5

73DP-0AP04 “Primary Coolant Sources Outside Containment Program Technical Specification 5.5.2;” Revision 1

73ST-9SI03, “Leak Test of SI/RCS Pressure Isolation Valves;” Revision 22

73ST-9XI03, “SI Train A Valves - InService Test,” Revision 12

73ST-9CH04, “Boron Injection Flow Test,” Revision 0

73ST-9SI05, “Leak Test of HPSI/LPSI Containment Isolation Check Valves;” Revision 9.

73ST-9CH06, “Charging Pumps-Inservice Test,” Revision 12

73ST-9XI06, “CH and SS Valves - Inservice Test,” Revision 13

73ST-9XI09, “Train A LPSI and HP Check Valves - InService Test;” Revision 5

73ST-9SI11, “Low Pressure Safety Injection Pumps Miniflow - Inservice Test,” Revision 13

73ST-9SI14, “LPSI Pumps Full Flow - InService Test,” Revision 10

73DP-9ZZ14, “Surveillance Testing,” Revision 4

73ST-9XI22, “CH Valves - Inservice Test,” Revision 10

73ST-9XI26, “NCE-V118, CHN-V835, and SI Train A Check Valves - Inservice Test,” Revision 2

73ST-9XI27, “CHA-HV-205, CHB-HV-203, and SI B Train Check Valves - Inservice Test,” Revision 2

73ST-9XI29 “LPSI/CS Suction and RWT Outlet Check Valves - Inservice Test,” Revision 9

73ST-9XI33, “HPSI Pump and Check Valve Full Flow Test,” Revision 23

87DP-0MC09, “Item Procurement Specification (IPS) Requirements,” Revision 29

01-E-ZZ1-0003, “Electrical Equipment Data Base,” Revision 15

73ST-9X130, “SIT Check Valve Exercise Test,” Revision 9

Calculations

03-EC-PB-200, “AC Overcurrent Protection Class 1E,” Revision 8

01-EC-MA-0221, “AC Distribution,” Revision 7

13-EC-PB-204, “AC Equipment Protection (4.16KV and 480V) Class 1E,” Revision 3

13-EC-PE-120, “Diesel Generator Neutral Grounding,” Revision 0

13-MC-SI-502 “ESF Pump Suction Lines Train B,” Revision 11.

13-MC-SI-312, “Evaluation of Cavitation Damage During HPSI Pump Full Flow Surveillance Testing,” Revision 0

13-MC-SI-307, “Evaluation of Safety Injection System Pump Interaction per NRC I&E Bulletin 88-04,” Revision 0

13-MC-SI-316, “HPSI Flow with Hot Leg Valve Fully Open,” Revision 0

13-MC-SI-014, “K Factor of Safety Injection Tank Discharge Piping,” Revision 1

13-NC-ZY-205 “Large Break LOCA, Radiological Consequences;” Revision 7

13-EC-PB-0203, “Motor Starting Times,” Revision 3

13-EC-NA-221, “Non-Class 1E 13.8KV Switchgear Protection,” Revision 1

13-JC-CH-0209 “Refueling Water Tank Level Instrument (Chx-L-203x, x = A,B,C,D) Setpoint and Uncertainty Calculation,” Revision 5

13-MC-SI-210, “Safety Injection Tank Pressure for SIT Check Valve Test,” Revision 2

13-MC-SI-503 “Safety Injection System Train A,” Revision 15

TR-9609 “Seal Piping Analysis of Low Pressure Safety Injection Pumps,” Revision 3

EAS-TR-7701-ASR, “Structural Integrity and Operability Analysis of High Pressure Safety Injection Pump,” Revision 3

13-NC-ZC-238, “System Design LOCA Analysis,” Revision 0

13-EC-PB-0101, “Undervoltage Protection,” Revision 6

13-NC-CH-A001, “Auxiliary Pressurizer Spray System Reliability Evaluation,” Revision 0

13-MC-CH-0311, “Chemical and Volume Control System (CH) Design Pressure and Temperature Calculation,” Revision 0 with Engineering Document Change 98-00581
13-NC-CH-0101, “CVCS (CH) Activities at Design and Normal Conditions,” Revision 5

01-MC-CH-0501, “CVCS - Charging Line,” Revision 5

01-MC-CH-0535, “CVCS - RCP Seal Injection,” Revision 4

13-MA-CH-0951, “CVCS System - Configuration Calculations,” Revision 0

13-MC-CH-0202, “Evaluation of Charging Pump NPSHA During Parallel Suction Alignment of the BAM Pumps from the RWT,” Revision 0

13-MC -HA-052, “Cooling Load Calculation for ESF Pump Rooms,” Revision 5

13-EC-CH-A002, “Qualified Life Reassessment of Charging Pump Plunger Packing Under Program PE-403,” Revision 0

Drawings:

01-E-PBA-001, “Single Line Diagram 4.16KV Class 1E Power System Switchgear 1E-PBA-SO3,” Revision 4

01-E-PBA-002, “Single Line Diagram 4.16KV Class 1E-Power System Switchgear 1E-PBB-SO4,” Revision 7

01-E-PGA-001, “Single Line Diagram 480V Class 1E Power System Load Center 1E-PGA-31,” Revision 6

01-E-PGA-002, “Single Line Diagram 480V Class 1E Power System Load Center 1E-PGB-L32,” Revision 7

01-E-PGA-003, “Single Line Diagram 480V Class 1E Power System Load Center 1E-PGA-L33,” Revision 6

01-E-PGB-004, “Single Line Diagram 480V Class 1E Power System Load Center 1E-PGB-L34,” Revision 7

01-E-PGA-005, “Single Line Diagram 480V Class 1E Power System Load Center 1E-PGA-L35,” Revision 2

01-E-PGA-006, “Single Line Diagram 480V Class 1E Power System Load Center 1E-PGB-L36,” Revision 5

01-E-PHA-005, “Single Line Diagram 480V Class 1E Power System Motor Control Center 1E-PHA-M35,” Revision 13

01-E-NHA-072, “Single Line Diagram 480V Class non-1E Power System Motor Control Center 1E-NHN-M72,” Revision 8

01-E-PBB-004, “Elementary Diagram 4.16KV Class 1E Power System Switchgear 1E-PBA-SO3 and 1E-PBB-SO4 Bus Potential Transformers,” Revision 10

01-E-PBB-001, “Elementary Diagram 4.16KV Class 1E Power System Switchgear 1E-PBA-S03 and 1E-PBB-SO4 4.16KV Normal Supply Breaker,” Revision 5

01-E-PBB-002, “Elementary Diagram 4.16KV Class 1E Power System Switchgear 1E-PBA-SO3 and 1E-PBB-SO4 4.16KV Alternate Supply Breakers,” Revision 6

01-E-PEB001, “Elementary Diagram Stand-By Generation System Diesel Generators 1E-PEA-001 and 1E-PEB-002 4.16KV Breaker,” Revision 14

G5-253-200, “Control Schematic (Diesel Generators) En-Tronic Controls Cooper Energy Services,” Revision 13

01-E-SIB-001, “Elementary Diagram Safety Injection & Shutdown CLG System HP Safety Injection Pump 1M-SIB-P02,” Revision 6

01-E-SIB-002, “Elementary Diagram Safety Injection & Shutdown CLG System LP Safety Injection Pump IM-SIB-PS01,” Revision 6

01-E-PGB-001, “Elementary Diagram 480V Class 1E Power Sys Load-Center 1E-PGA-L31, 1E-PGB-L32 4.16KV Supply Breaker,” Revision 5

01-E-PGB-006, “Elementary Diagram 480V Class 1E Power Sys Load-Center 1E-PGA-L31 380V Main Feeder Breaker, Revision 5

0143D483, “Indoor M26 Metalclad Switchgear (4.16KV Vendor Equipment arrangement drawings),” Revision 7

Work Packages/Design Mods

EDC 2001-00476
EDC 2001-00477
EWO (modification) 217593
WM 2393708
WM 2406650
WM 2492834
WO 241003 (ENG DM 13)
WO 903397
ENG DM 2446825

Work Orders

1055950	2306013	2327025	2350082	2374614
219575	2306022	2330056	2350366	2381078
2306009	2318369	233045	2374610	

50.59 Evaluations

95-00066
97-00129
01-00055

SI System Health Reports

3Q00
4Q00
1Q01
2Q01
3Q01
4Q01
1Q02
2Q02

Operability Determination

2503356

Environmental Equipment Qualification Data Files

EEQ-A610-001, “System Component Evaluation Worksheet,” Revision 11
EEQ-A610-001, “EQ Maintenance Data Sheet,” Revision 10
EEQ-L200-003, “System Component Evaluation Worksheet,” Revision 7
EEQ-L200-003, “EQ Maintenance Data Sheet,” Revision 7
EEQ-T020-001, “System Component Evaluation Worksheet,” Revision 8
EEQ-T020-001, “EQ Maintenance Data Sheet,” Revision 8
EEQ-T020-002, “System Component Evaluation Worksheet,” Revision 5
EEQ-T020-002, “EQ Maintenance Data Sheet,” Revision 5
EEQ-T020-003, “System Component Evaluation Worksheet,” Revision 8
EEQ-T020-003, “EQ Maintenance Data Sheet,” Revision 8
EEQ-V030-001, “System Component Evaluation Worksheet,” Revision 4
EEQ-V030-001, “EQ Maintenance Data Sheet,” Revision 3

Miscellaneous Documents

13-NS-B072, At-power PRA System Study for the Chemical and Volume Control System, Revision 0

NRC Letter March 23, 1999, Charging System Commitments for the Palo Verde Nuclear Generating Station (Tac. Nos. M91817, M911818, and M91819)

Component Performance Tracking and Trending Data Base

Operations Training Department Simulator Scenario, NLR02S0204, S-047N 4 Loss of Class 1E 480 V Load Center, Revision 00

Item Procurement Specification IPS-G080

Material Logistics Information System Inspection Plan, 44410562

Material Logistics Information System Inspection Plan, 44410563

APS Purchase Order 500237616 with Change Notice A

Receiving records for Purchase Order 500237616

VTM-I075-0001, Ingersoll-Dresser Pump Co. instruction manual for HPSI pump

EAS-TR-7701-ASR, “Structural Integrity & Operability Analysis of High Pressure Safety Injection Pump,” Revision 3

VTD-I075-0007, “Ingersoll-Rand Installation, Operation and Maintenance Instructions for 4X11 CA-8 High Pressure Safety Injection Pumps”

SKF Machine Reliability Assessment, Phase I, 3B HPSI Pump, dated May 3, 2002

Vibration Analysis Report for HPSI Pump 3MSIBP02

HPSI PUMP condition Overview dated July 31, 2002

13-EM-009, “Appendix 5B Engineering Data for 13.8KV and 4.16KV Metal-Clad Switchgear,” Revision 4

PB STM/Vol.28A, “System Training Manual class 1E 4.16KV Power System (PB),” Revision 2

PVNGS Design Basis, “Class 1E 4.16KV Power System,” Revision 7

PVNGS Design Basis, “Class 1E 480V AC Power Switchgear System,” Revision 6