



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

May 1, 2001

Gregg R. Overbeck, Senior Vice
President, Nuclear
Arizona Public Service Company
P.O. Box 52034
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SUBJECT: PALO VERDE NUCLEAR GENERATING STATION - NRC INTEGRATED
INSPECTION REPORT 50-528/01-02; 50-529/01-02; 50-530/01-02

Dear Mr. Overbeck:

On March 31, 2001, the NRC completed an inspection at your Palo Verde Nuclear Generating Station, Units 1, 2, and 3, facility. The enclosed report documents the inspection findings which were discussed on January 12, February 2, March 2, March 9, March 16, and March 30, 2001, with you and other members of your staff as described in Section 4OA6.

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. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel. Based on the results of this inspection, the inspectors identified one issue of very low safety significance (Green).

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response will be made 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/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

/RA/

Linda Joy Smith, Chief
Project Branch D
Division of Reactor Projects

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

Enclosure:
NRC Inspection Report
50-528/01-02; 50-529/01-02; 50-530/01-02

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RIV:RI:DRP/D	RI:DRP/D	SRI:DRP/D	RE:TSS	C:DRS/EMB
NLSalgado	GGWarnick	JHMoorman	GFLarkin	JLShackelford
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C:DRS/PSB	C:DRP/D			
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04/30/01	05/01/01			

ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Dockets: 50-528
50-529
50-530

Licenses: NPF-41
NPF-51
NPF-74

Report No: 50-528/01-02
50-529/01-02
50-530/01-02

Licensee: Arizona Public Service Company

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

Location: 5951 S. Wintersburg Road
Tonopah, Arizona

Dates: January 7 through March 31, 2001

Inspectors: B. O. Baca, Health Physicist
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R. W. Deese, Reactor Inspector
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G. G. Warnick, Resident Inspector

Accompanying Personnel: G. F. Larkin, Reactor Engineer

Approved By: L. J. Smith, Chief, Project Branch D, Division of Reactor Projects

Attachment: Supplemental Information

SUMMARY OF FINDINGS

Palo Verde Nuclear Generating Station, Units 1, 2, and 3
NRC Inspection Report 50-528/01-02; 50-529/01-02; 50-530/01-02

IR 05000528-01-02, IR 05000529-01-02, IR 05000530-01-02, on 01/07-03/31/01, Arizona Public Service Company, Palo Verde Nuclear Generating Station; Units 1, 2, and 3. Heat Sink Performance.

The inspection was conducted by resident inspectors, regional reactor inspectors, regional emergency preparedness inspectors, and regional health physicists. The inspection identified one Green finding. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609 "Significance Determination Process" (SDP). Findings for which the SDP does not apply are indicated by "No Color" or by the severity level of the applicable violation. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at <http://www.nrc.gov/NRR/OVERSIGHT/index.html>.

A. Inspector Identified Findings

Cornerstone: Mitigating Systems

- Green. The inspector identified that the licensee was not effectively trending essential cooling water heat exchanger thermal performance.

Ineffective heat exchanger performance trending could allow thermal performance to degrade below design bases limits without detection, which is a credible impact on safety. The essential cooling water system is a mitigating system. The finding was of very low safety significance, because the actual cumulative effect of these errors was less than the available thermal performance margin, and in all cases, the heat exchangers remained operable (Section 1R07).

B. Licensee Identified Findings

- Violations of very low significance which were identified by the licensee have been reviewed by the inspectors. Corrective actions taken or planned by the licensee appear reasonable. These violations are listed in section 4OA7 of this report.

Report Details

Unit 1 operated at essentially 100 percent power until March 31, 2001, when the unit was shut down for the ninth refueling outage.

Unit 2 operated at essentially 100 percent power for the duration of this inspection period.

Unit 3 began this period operating at 100 percent power. The unit was shut down on February 17, 2001, to replace the pump shaft on reactor coolant Pump 1B. The unit was returned to 100 percent power on March 2 and operated at that power for the remainder of this inspection period.

1. REACTOR SAFETY **Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity**

1R02 Changes to License Conditions and Safety Analysis Report (71111.02)

a. Inspection Scope

The inspectors reviewed 13 safety evaluations to verify that the licensee had appropriately considered the conditions delineated by 10 CFR 50.59 under which the licensee may make changes to the facility or procedures or conduct tests or experiments without prior NRC approval.

The inspectors reviewed 15 safety evaluation screenings, in which the licensee determined that safety evaluations were not required, to ensure that excluding a full evaluation was consistent with the requirements of 10 CFR 50.59.

The inspectors reviewed action requests and other related documents that addressed problems or deficiencies associated with 10 CFR 50.59 to ensure that appropriate corrective actions were being taken.

b. Findings

No findings of significance were identified.

1R05 Fire Protection - Monthly Routine Inspection (71111.05)

a. Inspection Scope

The inspectors conducted tours of the areas listed below that are important to reactor safety and referenced in the Pre-Fire Strategies Manual to evaluate conditions related to licensee control of transient combustibles and ignition sources; the material condition, operational status, and operational lineup of fire protection systems, equipment and features; and the fire barriers used to prevent fire damage from propagation of potential fires.

- Control Building 74-foot, 100-foot, 120-foot and 160-foot elevations (Unit 1)
- Auxiliary Building 40-foot, 51-foot 6-inch, 70-foot, and 88-foot elevations (Unit 2)
- Control Building 120-foot and 160-foot elevations (Unit 2)

- Control Building 120-foot and 160-foot elevations (Unit 3)
- Auxiliary Building 70-foot and 100-foot elevations (Unit 3)
- Reactor Building - all accessible elevations (Unit 3)

b. Findings

No findings of significance were identified.

1R06 Flood Protection (71111.06)

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report, the Design Basis Manual and other licensee documents to verify that the internal flood mitigation plans and equipment were consistent with the plants' design requirements and risk analysis assumptions. The inspectors also conducted walkdowns in Units 1, 2, and 3 Auxiliary Feed Pump Rooms and the 100-foot elevation level in the main steam support structure for susceptibility to internal flooding. The inspection looked at the integrity of the floor drain check valves, sump room level detection equipment and associated alarm circuitry, and the integrity of walls, ceilings, and piping penetration seals.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance (71111.07B)

The purposes of this inspection were to verify any potential heat exchanger deficiencies, which could mask degraded performance and to verify any potential common cause heat sink performance problems that have the potential to increase risk at the Palo Verde Nuclear Generating Station, Units 1, 2, and 3. Three heat exchangers ranked high in the plant risk assessment were chosen and are listed below:

- Essential cooling water (EW) heat exchangers
- Essential chillers
- Shutdown cooling heat exchangers

.1 Performance of Testing, Maintenance, and Inspection Activities

a. Inspection Scope

The inspector reviewed the licensee's test methodology for the selected heat exchangers. Specifically, this inspector critiqued the test method and test conditions contained in Procedure 70TI-9EW01, "Thermal Performance Testing of Essential Cooling Water Heat Exchangers," Revision 4.

The inspector also reviewed the results of the last two sets of this test on both EW heat exchangers in all three units. Specifically, the inspector verified proper extrapolation of

test conditions to design conditions, the tests used appropriate instrumentation, and the tests appropriately accounted for instrument inaccuracies. Additionally, the inspector verified these tests results were being adequately trended, the causes of the trends were being assessed, and that necessary actions were being taken for any step changes in these trends.

The inspector also checked that chemical treatments and methods used to control biotic fouling for the essential spray pond (SP) and EW systems were sufficient to ensure heat exchanger and heat sink performance.

b. Findings

Upon review of the test data and heat exchanger analysis using these test results, the inspector found several examples of ineffective heat exchanger monitoring that did not affect operability. This was determined to be a finding of very low safety significance (Green).

First, the inspector found one instance where the average spray pond outlet temperature for the EW heat exchanger used in the analysis did not match the value that should have been derived from the tests results. This instance was for the October 1996 testing of the Unit 1 EW Heat Exchanger A. Not using the test data gave inaccurate results for this test.

Second, the inspector found three instances where a mathematical error was made in the determination of the design inside film coefficient for the EW heat exchangers. The instances noted were for the October 1996 testing of the Unit 1 EW Heat Exchanger A, the April 1996 testing of the Unit 2 EW Heat Exchanger B, and the March 1997 testing of the Unit 3 EW Heat Exchanger B. This value for design film coefficient affected the final results of these three tests.

The inspector noted that no errors similar to these first two anomalies have occurred since peer reviews were initiated for the test results.

Third, the inspector found four instances where the licensee had conducted the thermal capacity tests with a differential temperature across the EW heat exchanger of either the spray pond or EW water of less than 3 °F. These were the October 1996 testing of the Unit 1 EW Heat Exchanger A, the April 1998 testing of the Unit 1 EW Heat Exchanger B, the October 1999 testing of the Unit 1 EW Heat Exchanger B, and the October 1998 testing of the Unit 3 EW Heat Exchanger A.

The licensee used the Electric Power Research Institute's heat transfer method as its test method. Electric Power Research Institute recommends performing this test with greater than a 3°F temperature differential and with temperature instruments with an accuracy of 0.1 °F or less because at lower temperature differentials instrument accuracies tend to mask true heat exchanger performance. Therefore, use of the test data of less than 3°F temperature differential leads to tests with poor results. Further complicating this matter, is the fact that when questioned, the licensee stated that the temperature instruments used in the testing were accurate to 0.5 °F.

Finally, the results of five tests indicated a negative inside fouling resistance at design conditions. These were the March 1998 testing of the Unit 1 EW Heat Exchanger A, the April 1999 testing of the Unit 2 EW Heat Exchanger A, the April 1999 testing of the Unit 2 EW Heat Exchanger B, the October 1998 testing of the Unit 3 EW Heat Exchanger A, and the October 1998 testing of the Unit 3 EW Heat Exchanger B.

A negative inside fouling resistance represents a physical impossibility or indicates tube wall thinning. Results indicating a negative inside fouling resistance were not questioned by the licensee and throw into doubt the validity of the results of these tests. The licensee accepted the results and did not formally question or review their validity.

The inspector concluded that the licensee was not effectively trending heat exchanger thermal performance and therefore could not reliably predict their encroachment upon design-basis conditions and effectively schedule future testing.

This finding had a credible impact on safety and could eventually affect (given future aging and plugging of tubes) the operability, availability, reliability, or function of the EW heat exchangers. The failure to effectively trend heat exchanger thermal performance could allow thermal performance to degrade below design-bases limits without detection. The finding was of very low safety significance (Green), because the actual cumulative effect of the identified errors was less than the available thermal performance margin. In all cases, the heat exchangers remained operable. This finding was in the mitigation systems cornerstone. The licensee initiated Condition Report/Disposition Request (CRDR) 2371907 to address this finding.

.2 Verification of Conditions and Operations Consistent with Design Bases

a. Inspection Scope

The inspector verified that the heat exchanger test criteria were consistent with the design bases. Specifically, the inspector reviewed the applicable design-basis calculations to ensure that the thermal performance test acceptance criteria for the shutdown cooling heat exchangers, essential chillers, and EW heat exchangers were being applied consistently throughout the calculations. The inspector also verified that the appropriate values for fouling and tube plugging for the EW heat exchanger were within the values used in the design-basis calculations. Finally, the inspector verified that parameters measured during the thermal performance and flow balance tests for the EW and systems were consistent with those assumed in the design bases.

b. Findings

No findings of significance were identified.

.3 Identification and Resolution of Problems

a. Inspection Scope

The inspector examined the licensee's corrective action program for significant

problems with the EW heat exchangers, shutdown cooling heat exchangers, and essential chillers over the past two years. The inspector reviewed 16 CRDRS, initiated by the licensee, that addressed problems or deficiencies associated with these heat exchangers in this effort. The inspector used Inspection Procedure 71152 as a guide for reviewing these issues and analyzed whether the actions taken for these problems was appropriate and sufficient to prevent recurrence.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification (71111.11)

a. Inspection Scope

On February 8, 2001, the inspectors observed classroom and simulator licensed operator requalification training. These training sessions were conducted to complete a corrective action for CRDR 2339523. This CRDR documented the Unit 2 reactor trip due to the core protection calculator auxiliary variable overpower trip during control element assembly withdrawal following a reactor power cutback. The trip occurred on November 18, 2000. The inspectors evaluated the training material used, and assessed the adequacy of the classroom presentation and simulator training for content and adherence to training objectives.

b. Findings

No findings of significance were identified.

1R12 Maintenance Rule Implementation (71111.12)

a. Inspection Scope

The inspectors evaluated the following equipment failures to verify that licensee personnel properly implemented the requirements of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants":

- Fuel Building Isolation Damper 3MHFA(B)M01 Failure (Unit 3)
- Emergency Diesel Generator (EDG) A Trip on High Jacket Water Temperature (Unit 2)
- Excure Nuclear Instrument Control Channel 1 Failure (Unit 2)
- Auxiliary Feedwater Pump A Trip-throttle Valve failure to remotely reopen (Unit 3)

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessment and Emergent Work Evaluation (71111.13)

a. Inspection Scope

Throughout this inspection period, the inspectors reviewed daily and weekly work schedules to determine when risk-significant activities were scheduled. The inspectors reviewed selected activities regarding risk evaluations and overall plant configuration control to verify compliance with Procedure 30DP-9MT03, "Assessment and Management of Risk When Performing Maintenance in Modes 1 - 4," Revision 0. The inspectors discussed emergent work issues with work control personnel and reviewed the potential risk impact of these activities to verify that the work was adequately planned, controlled, and executed. The specific activities reviewed were associated with planned and emergent maintenance on:

- EDG, Essential Spray Pond (SP), Essential Chilled Water (EC), EW, and Containment Spray (CS) Train A Online Outage (Unit 2)
- High Pressure Safety Injection Train B Online Outage (Unit 1)
- Low Pressure Safety Injection Train A Online Outage (Unit 1)
- EDG, SP, EC, EW, and CS Train B Online Outage (Unit 1)
- Work Order for EDG 2B Trip on Crankcase High Pressure During Cooldown Cycle (Unit 2)
- EDG, SP, EC, EW, and CS Train A Online Outage (Unit 1)
- Auxiliary Feedwater Pump A Trip-Throttle Valve Repair (Unit 3)
- Work Order for EDG 2A Trip on High Jacket Water Temperature During Cooldown Cycle (Unit 2)
- Plant Computer CPU Cabinet, CX1 Troubleshooting and Repair (Unit 1)
- EDG, SP, EC, EW, and CS Train A Online Outage (Unit 3)
- Low Pressure Safety Injection Train A Online Outage (Unit 2)

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

a Inspection Scope

The inspectors evaluated the operability determinations listed below for technical adequacy and assessed the impact of the condition on continued plant operation. Additionally, the inspectors reviewed Technical Specification entries, CRDRs, and equipment issues to verify that operability of plant structures, systems, and components was maintained.

- Operability Determination 2314253 evaluated the gas accumulation rate and venting frequency of the Unit 2 high pressure safety injection Train B header for compliance with Technical Specification 3.5.3.2. (Unit 2)
- Entry into TS 3.3.5 Condition A for declaring auxiliary feedwater actuation systems 1 and 2 Channel B inoperable. (Unit 2)
- Entry into TS 3.0.6 and safety function determination for the inoperability of Train B EDG, EC, EW, and CS during maintenance. (Unit 2)
- Operability Determination 2356074 evaluated the operability of the Unit 2 EDG, Train B with a minor air leak from an o-ring around the manual reset shaft for the Pressure Sensing Valve 2JDGNPV0262. (Unit 2)
- Operability Determination 183, Revision 5, evaluated the operability of the ECCS system when flow transmitters are removed from service one at a time for calibration. (Units 1, 2, 3)
- During performance of 73ST9DF01, fuel oil transfer pump failed to start when the day tank local level indicator reached the 40" setpoint. The EDG was declared inoperable. Troubleshooting determined that the local level indicator was out of calibration. This was determined by valving in the local site glass which indicated greater than the local indicator. Level was lowered in the tank and the transfer pump started as expected at the prescribed setpoint as indicated on the site glass. The inoperability declaration was retracted when it was determined that level was never low in the day tank and that the fuel oil pump would have started as required when level reached the setpoint. (Unit 2)
- Operability Determination 2339440 evaluated the operability of the diverse auxiliary feedwater system when commercial grade capacitors were installed in the system's Q-class power supplies without commercial grade dedication testing.
- Entry into Technical Specification 3.7.5, Condition B for auxiliary feedwater Pump A Trip-Throttle Valve repair. (Unit 3)
- Operability Determination 66 for dual indication for SGB-UV-228. (Unit 3)

- Operability of A Essential Chiller circuit breaker when the cubicle door was found partially unlatched. (Unit 1)
- Operability Determination 239 justified the operability of HPBUV0006 which was found to have an equipment qualification preventive maintenance task (45231) not performed within its required periodicity. (Units 1,2,3)
- CRDR 11149, evaluation of multiple Class 1E 480V motor control center circuit breakers with potential current trip setting coordination problems. (Unit 1)
- Operability Determination 110 evaluated the operability of the EC system with the surge tank automatic makeup function disabled. (Unit 3)
- Potential entry into TS 3.0.3 for loss of pressurizer heaters during maintenance which appeared to cause the pressurizer to be inoperable for approximately two minutes, contrary to Condition B of TS 3.4.9 and Condition B of TS 3.3.11. After further licensee review, TS 3.0.3 entry was rescinded since it was discovered that the class backup heaters and associated control circuits remained operable throughout the maintenance evolution. (Unit 1)
- Operability Determination 240, Revision 0, evaluated whether the main steam isolation valves and economizer main feedwater isolation valves remain operable and capable of performing their design safety function following a loss of offsite power event. (Units 1,2,3)
- Entry into Technical Specification 3.3.3, Condition A, for inoperable control element assembly calculator 1. (Unit 1)

b. Findings

No findings of significance were identified.

1R16 Operator Workarounds (71111.16)

.1 Review of the Cumulative Effects of Operator Workarounds

a. Inspection Scope

The inspectors interviewed operators and reviewed the Control Room Deficiency Log in Units 1, 2, and 3 to determine the number of operator workarounds that existed and to assess the cumulative effect of the workarounds.

b. Findings

No findings of significance were identified.

1R19 Postmaintenance Testing (71111.19)

a. Inspection Scope

The inspectors observed or evaluated the following postmaintenance tests to determine whether the test adequately confirmed equipment operability:

- Work Order 236925 Retest Performed after the Removal and Replacement of EDG Jacket Water Heater Pump. (Unit 1)
- Work Order 2318340 73ST-9SI06, "Containment Spray Pumps and Check Valves - Inservice Test," Revision 8 performed as the retest after sampling and changing the oil in CS pump motor upper bearing and lower bearing. (Unit 2)
- Work Order 2308674 73ST-9XI23, "CP [Containment Purge], EW, IA [Instrument Air], and NC [Nuclear Cooling Water] Valves - Inservice Test," Revision 5 and 73ST-9CL10, "Containment Ventilation Purge Isolation Valve - Penetration 57," Revision 9 performed as retests following the overhaul of CPAUV0002B, Containment Ventilation Purge Isolation Valve. (Unit 1)
- Work Order 230786 73ST-1XI11, "Safety Injection Train A Emergency Core Cooling System Throttle Valves - Inservice Test," Revision 14 and 73ST-9SI11, "Low Pressure Safety Injection (LPSI) Pump Miniflow - Inservice Test," Revision 12 performed as retests following LPSI Train A motor and valve online outage. (Unit 1)
- Work Order 2312321 Reviewed retest requirements following rework of loose indicator valves on EDG Train B. (Unit 2)
- Work Order 2315843 73ST-9XI14, "Train B High Pressure Safety Injection (HPSI) and Miscellaneous Safety Injection Valves - Inservice Test," Revision 12 and 73ST-9SI10, "HPSI Pumps Miniflow - Inservice Test," Revision 18 performed as retests following HPSI Pump B online outage. (Unit 1)
- Work Order 2360500 Perform troubleshooting and rework of Valve 3JAFHV0054. (Unit 3)
- Work Order 2351782 Disassemble/Reassemble reactor coolant Pump 1B for shaft replacement. (Unit 3)
- Work Order 237080 and 910376 73ST-9XI33, "HPSI Pump and Check Valve Flow Test," Revision 20. (Unit 2)

- Work Order 237080, 73ST-9SI03, "SI Train A Valves- Inservice Test," 910173, and 910376 Revision 10. (Unit 2)
- Work Order 237908 73ST-9AF02, "AFA-P01 - Inservice Test," Revision 17 performed as retest following auxiliary feedwater valve maintenance. (Unit 2)

b. Findings

No findings of significance were identified.

1R20 Outage Activities (71111.20)

.1 Review of the Unit 3 Outage Plan

a. Inspection Scope

The inspectors reviewed the licensee's outage risk assessment, Palo Verde Unit 3 Short Notice Outage Risk Assessment, to verify that the licensee appropriately considered risk in planning and scheduling the outage activities. The inspectors verified that the licensee had predetermined plant configurations for the outage and that these configurations had been assessed for risk significance.

b. Findings

No findings of significance were identified.

.2 Reduced Inventory and Midloop

a. Inspection Scope

The inspectors observed, Unit 3 midloop activities to verify that the licensee had appropriately considered the risk associated with this activity. The inspectors verified that multiple sources of electrical power, multiple reactor vessel level indications, and multiple reactor coolant system temperature indications were available. The inspectors observed licensee compliance with the following procedures:

- 40OP-9ZZ16 "Reactor Coolant System Drain Operations," Revision 22
- 40OP-9ZZ20 "Reduced Inventory Operations," Revision 2

b. Findings

No findings of significance were identified.

.3 Monitoring of Heatup and Startup Activities

a. Inspection Scope

The inspectors observed the Unit 3 startup to verify that portions of the startup were conducted in compliance with Technical Specifications (TS) and administrative requirements. The inspectors accompanied licensee personnel during the performance of Procedure 40ST-9ZZ09 "Containment Cleanliness Inspection," Revision 4 to assess containment cleanliness and material condition of components.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

.1 Carbon Dioxide Fire Suppression System Initiation During Functional Testing (Unit 1)

a. Inspection Scope

On December 19, 2000, maintenance personnel performed functional testing on the Unit 1 Channel B class battery room portion of the carbon dioxide (CO₂) suppression system in accordance with Procedure 14FT-9FP08, "CO₂ Fire Suppression System Functional Test," Revision 7. During the performance of this test, an inadvertent discharge of the CO₂ system occurred in engineered safety features (ESF) switchgear Room B. The inspectors observed licensee actions taken to terminate the discharge, assess personnel and equipment conditions, and establish necessary compensatory measures for degraded fire protection equipment. Additionally, the inspectors reviewed the human performance evaluation part of CRDR 2346379.

b. Findings

No findings of significance were identified.

1R23 Temporary Modifications (71111.23)

a. Inspection Scope

The inspectors reviewed Temporary Modification Work Order 2333546 that was implemented to replace a failed heating element in the Unit 2 Pressurizer. The failed heating element was from a class heater bank and was replaced electrically by an element from a nonclass backup bank. The inspectors evaluated this temporary modification and associated 10 CFR 50.59 screening against the system design basis documentation and verified that the modifications did not adversely affect system operability or availability. Additionally, the inspectors verified that the installations were consistent with applicable modification documents and was conducted with adequate configuration control.

b. Findings

No findings of significance were identified

Emergency Preparedness (EP)

1EP1 Exercise Evaluation (71114.01)

a. Inspection Scope

The inspectors reviewed the objectives and scenario for the 2001 exercise to determine if the exercise would acceptably test major elements of the emergency plan. The scenario simulated a fire affecting plant equipment, fission product barrier failures, core damage and a radiological release to the environment via the steam supply system to demonstrate the licensee's capabilities to implement the emergency plan.

The inspectors evaluated exercise performance by focusing on the risk-significant activities of classification, notification, protective action recommendations, and offsite dose consequences in the following emergency response facilities:

- Simulator Control Room
- Technical Support Center
- Operations Support Center
- Emergency Operations Facility

The inspectors also assessed personnel recognition of abnormal plant conditions, the transfer of emergency responsibilities between facilities, communications, protection of emergency workers, emergency repair capabilities, and the overall implementation of the emergency plan.

The inspectors attended the postexercise critiques in each of the above facilities to evaluate the initial licensee self-assessment of exercise performance. The inspectors also attended a subsequent formal presentation of critique items to plant management.

b. Findings

No findings of significance were identified.

1EP4 Emergency Action Level and Emergency Plan Changes (71114.04)

a. Inspection Scope

The inspectors reviewed Revision 23 to the Palo Verde Nuclear Generating Station Emergency Plan against 10 CFR 50.54(q) to determine if the revision decreased the effectiveness of the plan.

b. Findings

No findings of significance were identified.

1EP6 Drill Evaluations

a. Inspection Scope

On February 15, 2001, the licensee conducted an emergency preparedness drill. Prior to the drill, the inspectors reviewed the scenario to determine whether it was of appropriate scope to be included in the performance indicator statistics as intended by the licensee. During the drill, the inspectors observed performance of the operations crew in the simulator, as well as licensee performance in the Technical Support Center and Emergency Operations Facility. The inspectors observed activities involving event classification, notification, and protective action recommendations. The inspectors' observations were compared with licensee identified findings to determine the adequacy of the licensee's exercise evaluation process.

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety

Occupational Radiation Safety (OS)

2OS1 Access Controls to Radiologically Significant Areas (71121.01)

a. Inspection Scope

Radiation workers and radiation protection personnel were interviewed concerning their radiation protection work requirements. A number of tours of the radiologically controlled area in each unit were conducted. The following items were reviewed to ensure that the physical and administrative controls for airborne areas, radiation areas, high radiation areas, locked high radiation areas, and worker adherence to these controls were generally accomplished in accordance with regulatory requirements and exceptions were appropriately dispositioned in the licensee's corrective action program:

- Nuclear Assurance Audit Report 99-08
- Nuclear Assurance Evaluation Reports
- Selected Radiation Protection Department self-assessments performed since January 2000
- Access controls and surveys of two high dose work areas in the radiologically

controlled area: transfer of spent fuel pool ion exchange resin to the high activity resin storage tank in Unit 1 and the operation of the CD-1000 waste processing unit in Unit 2

- Selected radiation exposure permits and specified electronic dosimeter set points
- Placement of personnel dosimetry
- Radiation postings and barricades at entrances to high radiation areas and locked high radiation areas
- Job coverage by radiation protection personnel for the Unit 1 spent resin transfer and the operation of the CD-1000 waste processing unit in Unit 2
- Radiation protection program procedures
- Radiation protection as-low-as-is-reasonably-achievable (ALARA) prejob briefing (tailboard) for the Unit 1 spent resin transfer
- A summary of condition reports/disposition requests written between August 1, 1999, and January 16, 2001. Fifteen of these condition reports/disposition requests dealing specifically with high radiation areas and radiation worker performance were reviewed in detail.

b. Findings

No findings of significance were identified.

2OS2 ALARA Planning and Controls (71121.02)

a. Inspection Scope

The inspector interviewed radiation workers and radiation protection personnel throughout the radiologically controlled area and conducted independent radiation surveys of selected work areas. The following items were reviewed and compared with regulatory requirements to determine whether the licensee had an adequate program to maintain occupational exposures ALARA:

- ALARA program procedures
- ALARA Quality Assurance surveillance reports since July 2000
- Processes used to estimate and track exposures
- Plant collective exposure history for the past 3 years, current exposure trends, and 3-year rolling average dose information
- Six radiation exposure permit packages for work activities which could result in the

highest personnel collective exposures during Outages 2R9 (2-3508C, 2-3412A, 2-3412B) and 3RM9 (3-3320A, 3-3319D, 3-1254A)

- Use of engineering controls to achieve dose reductions including temporary shielding
- Individual exposures of selected work groups (mechanical maintenance and operations)
- Refueling Outage U2R9 ALARA Committee Challenge Goal Proposal and Report
- Hot spot tracking and reduction program
- Radiological work planning
- A summary of ALARA and radiological worker performance Condition Reports/Disposition Requests written since July 17, 2000; 10 Condition Reports/Disposition Requests were reviewed in detail (2310929, 2311114, 2314478, 2326283, 2328724, 2329268, 2337040, 2341338, 2352218, 2356818)
- Declared pregnant worker dose monitoring controls
- ALARA Committee Quarterly Meeting Minutes since July 2000
- Job site inspections and ALARA controls

b. Findings

No findings of significance were identified.

2OS3 Radiation Monitoring Instrumentation (71121.03)

a. Inspection Scope

The inspector interviewed cognizant licensee personnel and compared the following items to regulatory requirements:

- Calibration, operability, and alarm setpoint, when applicable, of portable radiation detection instrumentation, whole-body counting equipment, area radiation monitors, continuous air monitors, containment high range monitors, main steam line monitors, steam generator blow-down monitors, and personnel contamination monitors
- Calibration expiration and source response check currency on radiation detection instruments staged for use
- The status and surveillance records of self-contained breathing apparatuses staged and ready for use in the plant
- The licensee's capability for refilling and transporting self-contained breathing

apparatus air bottles to and from the control room and operations support center during emergency conditions

- Control room operator and emergency response personnel training and qualifications for use of self-contained breathing apparatus
- Licensee self-assessments and audits, focusing on radiological incidents that involved personnel internal exposures
- Selected exposure significant radiological incidents that involved radiation monitoring instrument deficiencies or self-contained breathing apparatuses

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES (OA)

4OA1 Performance Indicator Verification (71151)

.1 Occupational Exposure Control Effectiveness

a. Inspection Scope

The inspector reviewed corrective action program records for high radiation areas, locked high radiation areas, and unplanned exposure occurrences for the past 12 months to confirm that these occurrences were properly recorded as performance indicators. Radiologically controlled area exit transactions with exposures greater than 100 millirems for the past 12 months were reviewed. Selected examples were investigated to determine whether they were within the dose projections of the governing radiation work permits.

b. Findings

An Unresolved Item (URI) (50-530/0104-01) involving a performance indicator occurrence related to CRDR 117874, "Hot spot identified on Low Pressure Safety Injection Pump "B" cyclone separator," dated May 4, 2000, is discussed in Section 40A1 of Inspection Report 50-528/01-04, 50-529/01-04, 50-530/01-04.

.2 Radiological Effluent Technical Specification/Offsite Dose Calculation Manual
Radiological Effluent Occurrences

a. Inspection Scope

The inspector reviewed radiological effluent release program corrective action records, licensee event reports, and annual effluent release reports documented during the past

four quarters to determine if any doses resulting from effluent releases exceeded the performance indicator thresholds.

b. Findings

No findings of significance were identified.

.3 Drill and Exercise Performance

a. Inspection Scope

The inspectors verified a sample of the licensee's reported results for the drill and exercise performance indicator by reviewing records for licensee exercises, actual declared emergencies, drills, and simulator training scenarios conducted during calendar year 2000.

b. Findings

No findings of significance were identified.

.4 Emergency Response Organization Readiness Performance Indicator Verification

a. Inspection Scope

The inspectors verified the licensee's reported results for the emergency response organization drill participation performance indicator for calendar year 2000 by reviewing drill participation attendance records for a sample of 48 key emergency responders.

b. Findings

No findings of significance were identified. The performance indicator remained in the licensee response band (Green).

.5 Alert and Notification System Reliability Performance Indicator Verification (71151)

a. Inspection Scope

The inspectors verified the licensee's reported results for the alert and notification system reliability performance indicator by reviewing a sample of offsite siren test results performed in calendar year 2000.

b. Findings

No findings of significance were identified. The performance indicator remained in the licensee response band (Green).

.6 Mitigating Systems Cornerstone

a. Inspection Scope

The inspectors reviewed the unit logs and a maintenance rule database from January through December, 2000, to verify the accuracy and completeness of the unavailability data for the residual heat removal and high pressure safety injection systems reported on all three units. The inspectors reviewed Licensee Event Reports issued from January 2000 to date, CRDRs, and Unit Logs to verify the accuracy and completeness of the Safety System Functional Failures performance indicator for all three units..

b. Findings

No findings of significance were identified. The performance indicators all remained in the licensee response band (Green).

.7 Barrier Integrity Cornerstone

a. Inspection Scope

The inspectors reviewed a portion of the results from the daily reactor coolant system sample and daily reactor coolant system leak rate surveillance from January through March, 2000, to verify the accuracy and completeness of the data reported for the reactor coolant system specific activity and reactor coolant system leakage performance indicators for all three units.

b. Findings

No findings of significance were identified. The performance indicators all remained in the licensee response band (Green).

4OA3 Event Followup (71153)

- .1 (Closed) Licensee Event Report (LER) 50-529/2000-004-00: Reactor Coolant System Pressure Boundary Leakage Due to Degraded Alloy 600 Pressurizer Heater Sleeve. The inspectors reviewed the LER and no findings of significance were identified. This event has been addressed and corrected through the licensee's corrective action program and documented on CRDR 2326705. This event did not constitute a violation of NRC requirements.

4OA5 Other

- .1 (Closed) URI 50-529/0009-01: Long-term Cooling Portion of Feedwater Line Break Accident Analysis Did Not Consider Plugged Steam Generator Tubes.

The failure to update the long-term analysis was placed in the licensee's corrective action program and documented on CRDR 2316982. The inspector reviewed the actions taken in this CRDR and no findings of significance were identified (i.e., the design criteria were

met). This failure constituted a violation of minor significance that is not subject to enforcement action in accordance with Section IV of the Enforcement Policy.

4OA6 Meetings, including Exit

The Senior Health Physicist who inspected radiation monitoring instrumentation (Section 2OS3) presented inspection results to Ms. A. Krainik, Director, Regulatory Affairs, and other members of the licensee staff at the conclusion of the inspection on January 12, 2001. The licensee acknowledged the findings presented.

The Senior Health Physicist who inspected access controls to radiologically significant areas (Section 2OS1) and the occupational and public radiation safety cornerstone performance indicators (Sections 4OA1.1 and 4OA1.2) presented inspection results to Mr. G. Overbeck, Senior Vice President - Nuclear, and other members of the licensee staff at the conclusion of the inspection on February 2, 2001. The licensee acknowledged the findings presented. A followup telephone conversation was conducted on February 22, 2001, with Messrs. D. Kanitz, D. Marks, and G. Seaman to discuss the recharacterization of issues presented during the exit meeting.

The Health Physicist who inspected ALARA planning and controls (Section 2OS2) presented inspection results to Mr. G. Overbeck, Senior Vice President - Nuclear, and other members of the licensee staff at the conclusion of the inspection on March 2, 2001. The licensee acknowledged the findings presented.

The Senior Reactor Inspector who inspected changes to license conditions and the safety analysis report (Section 1R02) presented inspection results to Mr. G. Overbeck, Senior Vice President - Nuclear, and other members of the licensee staff at the conclusion of the inspection on March 9, 2001. The licensee acknowledged the findings presented.

The Reactor Inspector who inspected heat sink performance (Section 1R07) presented inspection results to Mr. G. Overbeck, Senior Vice President - Nuclear, and other members of the licensee staff on March 9, 2001.

The Emergency Preparedness inspectors who evaluated the emergency exercise (Sections 1EP1 and 1EP4) and the emergency preparedness cornerstone performance indicators (Sections 4OA1.3, 4OA1.4, and 4OA1.5) presented inspection results to Mr. G. Overbeck, Senior Vice President - Nuclear, and other members of the licensee staff at the conclusion of the inspection on March 16, 2001. The licensee acknowledged the findings presented.

The resident inspectors presented inspection results to Mr. G. Overbeck, Senior Vice President - Nuclear, and other members of the licensee staff on March 30, 2001. The licensee acknowledged the findings presented.

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

40A7 Licensee Identified Violations

The following findings of very low significance were identified by the licensee and are violations of NRC requirements which meet the criteria of Section VI.A of the NRC Enforcement Policy, NUREG-1600 for being dispositioned as noncited violations (NCVs). If you deny these noncited violations, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Palo Verde Nuclear Generating Station facility.

NCV Tracking Number

Requirement Licensee Failed to Meet

50-530/01-02-01

Technical Specification 5.4, "Procedures," requires that written procedures be implemented and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978. Section 8.b.(1)(j) of this Regulatory Guide includes procedures to perform surveillance testing of the Emergency Core Cooling System. However, Procedure 73ST-9SI06, "Containment Spray Pumps and Check Valves - Inservice Test," Revision 9, which gives instructions for performing the CS pump surveillance test, was not adequately maintained. On February 26, 2001, performance of the steps as written resulted in water being inadvertently transferred from the Unit 3 reactor coolant system to the refueling water tank, while the unit was in Mode 5. The violation was of very low safety significance (Green) because operators had multiple methods and sufficient time to stop the inventory loss before the point where a loss of suction on safety injection pumps could occur. This violation is in the licensee's corrective action program as CRDR 2365447 and is being treated as an NCV.

50-528/01-02-02

Technical Specification 5.7.1 requires, in part, that any individual entering a high radiation area be provided a radiation monitoring device which continuously integrates the radiation dose rate in the area and alarms when a preset integrated dose is received. On October 8, 1999, an individual entered a high radiation area without an alarming dosimeter. The violation was of very low safety significance (Green) because the event did not involve a very high radiation area, a personnel over exposure, or a substantial potential for an over exposure, and the ability to assess dose was not compromised because the individual was wearing thermoluminescent dosimetry. This violation is in the licensee's corrective action program as CRDR 107125 and is being treated as a NCV.

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

R. Barringer, Advisor, Safety
S. Bauer, Department Leader, Regulatory Affairs
K. Bell, Team Leader, Radiation Monitoring System Maintenance
M. Brutcher, Section Leader, Design Engineering
J. Bungard, Technical Management Assistant, Radiation Protection
S. Burns, Department Leader, Systems Engineering
R. Buzard, Senior Consultant, Nuclear Regulatory Affairs
D. Carnes, Department Leader, Operations
D. Crozier, Department Leader, Emergency Planning
M. Czarnylas, Leader, Fire Protection
S. Dodd, Instructor, Fire Protection
D. Fan, Department Leader, Design Engineering
M. Fladager, Department Leader, Radiation Protection
J. Gaffney, Director, Radiation Protection
F. Gowers, Site Representative, El Paso Electric
T. Gray, Department Leader, Radiation Protection
S. Grier, Department Leader, Nuclear Assurance
T. Haggard, Senior Technician, Radiation Protection
D. Hautala, Senior Engineer, Regulatory Affairs
R. Henry, Site Representative, Salt River Project
J. Hesser, Director, Work Management and Outages
L. Hopson, Advisor, Fire Protection
R. Hunnicutt, Senior Engineer
B. Ide, Vice President, Nuclear Production
S. Jones, Section Leader, Systems Engineering
J. Jones, Senior Technician, Radiation Protection
S. Lantz, Section Leader, Radiation Protection Operations
D. Kanitz, Senior Engineer, Regulatory Affairs
A. Krainik, Director, Emergency Services Division
D. Leech, Department Leader, Nuclear Assurance Division
J. Levine, Executive Vice President, Generation
R. Lucero, Department Leader, Engineering and Support
D. Marks, Section Leader, Nuclear Regulatory Affairs
D. Mauldin, Vice President, Engineering and Support
J. McDonnell, Section Leader, Radiation Protection
P. Murphey, Senior Engineer
G. Overbeck, Senior Vice President, Nuclear
S. Peace, Consultant, Communications
C. Podgurski, Section Leader, Radiological Engineering
R. Routolo, Section Leader, Chemistry
L. Sandal, Senior Engineer
J. Scott, Director, Chemistry
C. Seaman, Director, Regulatory Affairs

J. Simpkins, System Engineering
D. Smith, Director, Operations
M. Sontag, Section Leader, Nuclear Assurance
D. Straka, Regulatory Affairs
T. Weber, Senior Engineer
P. Wiley, Department Leader, Operations
R. Wilfred, 10 CFR 50.59 Coordinator
M. Winsor, Director, Nuclear Engineering

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

50-530/01-02-01	NCV	Inadequate surveillance test procedure causes inadvertent reactor coolant system partial drain while shutdown (Section 4OA7).
50-528/01-02-02	NCV	Failure to wear required dosimetry when entering a high radiation area (Section 4OA7).

Closed

50-529/2000-004-00	LER	Reactor Coolant System Pressure Boundary Leakage Due to Degraded Alloy 600 Pressurizer Heater Sleeve (Section 4OA3).
50-529/0009-01	URI	Long-term Cooling Portion of Feedwater Line Break Accident Analysis Did Not Consider Plugged Steam Generator Tubes (Section 4A05).

DOCUMENTS REVIEWED

The following documents were selected and reviewed by the inspectors to accomplish the objectives and scope of the inspection and to support any findings:

Procedures	Title	Revision
01DP-0IS08	PVNGS Respiratory Protection Equipment Usage	7
01DP-0IS10	PVNGS Respiratory Protection Program	1
01DP-0IS12	Confined Space Entry	4
14DP-9IS01	Respiratory Equipment Maintenance Inspection and Repair	3
14DP-9IS03	Filling Breathing Air Cylinders	2
15DP-0TR72	General Employee Training Program Description	4

Procedures	Title	Revision
40DP-9OP02	Conduct of Shift Operations	16
40OP-9IA02	Service/Breathing Air System	12
40AO-9ZZ19	Control Room Fire	5
40AO-9ZZ20	Loss of HVAC	0
60DP-0QQ19	Internal Audits	8
70TI-9EW01	Thermal Performance Testing of EW Heat Exchangers	4
73DP-9ZZ10	Guidelines for Heat Exchanger Thermal Performance Analysis	3
74DP-0LC02	Public Radiation Safety Performance Indicator	0
74ST-9SQ22	Radiation Monitoring Calibration Test for Baseline Area Radiation Monitors	6
74ST-9SQ23	Radiation Monitoring Calibration Test for New Scope Area Monitors	7
74RM-9EF42	Radiation Monitor Alarm Setpoint Determination	17
75RP-0LC01	Performance Indicator Instruction Guideline Occupational Radiation Safety Cornerstone	0
75RP-0RP01	Radiological Posting	17
75RP-9RP01	Radiological Surveys	9
75RP-9OP02	Control of Locked High Radiation Areas and Very High Radiation Areas	13
75RP-9RP02	Radiation Exposure Permits	15
75RP-9EQ04	Calibration of Neutron Dose Rate Instruments	4
75RP-9EQ13	Canberra Whole Body Counting System Calibration	3
75RP-9EQ18	Calibration of Portable Count Rate Instrumentation	2
75RP-9EQ20	Calibration of Gamma and Beta-Gamma Dose Rate Instruments	5
75RP-9EQ25	Calibration of Eberline PCM-2 Contamination Monitors	8
93DP-0LC09	Collection and Submittal of NRC Performance Indicator	1
90DP-01P10	Condition Reporting	10

Training

NGR03	Self-Contained Breathing Apparatus Training Lesson Plan
NGR03-P-001-98	Job Performance Measure for Self-Contained Breathing Apparatus Use
NGR07-P-002-00	Job Performance Measure for Control Room Habitability/FTA SCBA Use
	Emergency Services Training Attendance Documentation for Course No. NGR07

Assessments

- Adequacy Assessment of Self-Contained Breathing Apparatus (93-003-726)
- Respiratory Protection Program Self-Assessment 98-06-12 (June 23 - November 6, 1998)
- RP Self-Assessment - Unit 1 Calibration Facility, Unit Satellite Labs, and Calibration Bunker Area Assessment (May 2000, July 2000, and November 3 and 6, 2000)
- Nonradiological Respiratory Protection Program Regulatory Compliance Audit Report (December 5-8, 2000)
- Dry active waste stream analysis for Units 1, 2, and 3

Heat Exchanger Test and Analysis Results

70TI-9EW01 Thermal Performance Testing of EW Heat Exchangers
and
73DP-9ZZ10 Guidelines for Heat Exchanger Thermal Performance Analysis

<u>EW Heat Exchanger</u>	<u>Test Date</u>
1A	March 27, 1998
1A	October 11, 1996
1B	April 1, 1998
1B	October 14, 1999
2A	April 23, 1999
2A	October 7, 2000
2B	April 5, 1996
2B	April 8, 1999
3A	October 16, 1998
3A	April 8, 2000
3B	March 27, 1997
3B	October 1, 1998

Nuclear Assurance Evaluation Reports

99-0055, 99-0621, 00-0272, 00-0387, 00-0379

Radiation Protection Self-Assessments

Task Q-2 (2/9-11/00), Task Q-10 (2/16/00), Tasks Q-4 & Q-5 (3/3-20/00), Task Q-3 (3/12/00), Task Q-4 (5/18/00), Task Q-1 (7/7/00), Task Q-4 (8/21/00), Task Q-5 (9/22-26/00), and Task Q-1 (11/16/00)

Radiation Exposure Permits

- 2-1007A "Routine Containment Building Entries (All Modes)"
- 9-1006A "Change Out Process Filters and Transport to Storage Area"
- 9-1028A "Transfer Spent Resin From PC and CH Ion Exchange Vessels to HASRT"

Condition Reports/Disposition Requests

107125, 113251, 111803, 117237, 117350, 117417, 117874, 117970, 118390, 119172, 2309249, 2310929, 2328724, 2316982, 2329874

LIST OF ACRONYMS USED

ALARA	as-low-as-reasonably-achievable
CFR	Code of Federal Regulations
CO2	carbon dioxide
CP	containment purge
CRDR	condition report/disposition request
CS	containment spray
EC	essential chilled water
EDG	emergency diesel generator
EP	emergency preparedness
EW	essential cooling water
HPSI	high pressure safety injection
IA	instrument air
LER	licensee event report
LPSI	low pressure safety injection
NC	nuclear cooling water
SDP	significance determination process
SP	Essential Spray Pond
TS	Technical Specifications
URI	unresolved item
VIO	Violation