UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

April 21, 2003

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 50-528/03-02; 50-529/03-02; 50-530/03-02

Dear Mr. Overbeck:

On March 22, 2003, the NRC completed an inspection at your Palo Verde Nuclear Generating Station, Units 1, 2, and 3. The enclosed report documents the inspection findings which were discussed with members of your staff on April 2, 2003, and as described in Section 4OA6.

The inspection examined activities conducted under your licenses 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.

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/reading-rm/adams.html (the Public Electronic Reading Room).

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
50-528/03-02; 50-529/03-02; 50-530/03-02

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ADAMS: ☐ Yes ☐ No Initials: _____
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RIV:RI:DRP/D	RI:DRP/D	PE:DRP/D	SRI:DRP/D	SPE:DRP/D
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SRA	SRA	C:DRS/PSB	C:DRP/D	
MFRunyan	DPLoveless	TWPruett	LJSmith	
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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:	50-528/03-02 50-529/03-02 50-530/03-02
Licensee:	Arizona Public Service Company
Facility:	Palo Verde Nuclear Generating Station, Units 1, 2, and 3
Location:	5951 S. Wintersburg Road Tonopah, Arizona
Dates:	December 29, 2002, through March 22, 2003
Inspectors:	N. L. Salgado, Resident Inspector J. F. Melfi, Resident Inspector G. G. Warnick. Resident Inspector P. J. Elkmann, Emergency Preparedness Inspector R. E. Lantz, Senior Emergency Preparedness Inspector
Approved By:	Linda Joy 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 50-528/03-02; 50-529/03-02; 50-530/03-02

IR 05000528-03-02, IR 05000529-03-02, IR 05000530-03-02, Arizona Public Service Company; on 12/29/02 - 03/22/03, Palo Verde Nuclear Generating Station, Units 1, 2, and 3; personnel performance during nonroutine evolutions and event followup.

The inspection was conducted by the resident inspectors and two emergency preparedness inspectors. 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.

A. Inspectors Identified Findings

No findings of significance were identified.

Report Details

Summary of Plant Status

Unit 1 operated at essentially full power for the duration of this inspection period.

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

Unit 3 operated at essentially full power for the duration of this inspection period.

1. REACTOR SAFETY
Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity
[REACTOR - R]

1R04 Equipment Alignment (71111.04)

1. Partial Walkdowns

a. Inspection Scope

The inspectors completed a partial walkdown of the systems listed below to verify proper equipment alignment. This inspection included a review of the applicable plant procedures, plant drawings, outstanding modifications, work orders and condition report/disposition requests (CRDR). The inspectors verified that all valves were properly aligned; there was no leakage that could affect operability; electrical power was available as required; major system components were properly labeled, lubricated, and cooled; and hangers and supports were correctly installed and functional.

- January 8, 2003, auxiliary feedwater system Train B (Unit 2)
- January 29, 2003, emergency diesel generator Train A (Unit 2)
- March 6, 2003, high pressure safety injection system Train A (Unit 3)

b. Findings

No findings of significance were identified.

.2 Complete Walkdown of the Chemical and Volume Control System (CVCS)

a. Inspection Scope

During the weeks of March 10 and 17, 2003, the inspectors completed walkdowns of the accessible portions of Units 1, 2, and 3 CVCS. The inspectors verified that the system was capable of performing required safety functions, the licensee properly performed mechanical and electrical system alignments, and system valves did not exhibit leakage that would adversely impact function. The inspectors also checked major system components for correct labeling and lubrication, that hangers and supports were correctly installed, and that functional and essential support systems were operational.

The inspectors reviewed the following documents to determine correct system alignment:

- P&I Diagram 01-M-CHP-001, "Chemical and Volume Control System," Revision 24
- P&I Diagram 01-M-CHP-002, "Chemical and Volume Control System," Revision 43
- P&I Diagram 01-M-CHP-003, "Chemical and Volume Control System," Revision 38
- P&I Diagram 02-M-CHP-002, "Chemical and Volume Control System," Revision 39
- P&I Diagram 02-M-CHP-003, "Chemical and Volume Control System," Revision 29
- P&I Diagram 03-M-CHP-001, "Chemical and Volume Control System," Revision 22
- P&I Diagram 03-M-CHP-002, "Chemical and Volume Control System," Revision 37
- P&I Diagram 03-M-CHP-003, "Chemical and Volume Control System," Revision 26
- Trend analyses for tagging errors
- System health report for the CVCS
- Updated Final Safety Analysis Report

The inspectors also reviewed selected CRDRs, outstanding corrective maintenance requests, the system health report, temporary modifications, and outstanding design issues.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05Q)

a. Inspection Scope

The inspectors conducted tours of the areas listed below that are important to reactor safety and referenced in the Prefire 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.

- January 22, 2003, auxiliary building 100-foot, 120-foot, and 140-foot elevations (Unit 3)
- March 4, 2003, control building 74-foot, 100-foot, 120-foot, and 160-foot elevations (Unit 2)
- March 17, 2003, diesel generator building - all accessible elevations (Unit 1)
- March 21, 2003, diesel generator building - all accessible elevations (Unit 3)

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12Q)

a. Inspection Scope

The inspectors verified the licensee's appropriate handling of structure, system, and component performance or condition problems during review of the following equipment failure. Additionally, the inspectors evaluated the following equipment failure 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":

- March 21, 2003, instrument air Compressor C trip reported in CRDR 2585270 and overall system health (Units 1, 2, and 3)

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments 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 risk evaluations and overall plant configuration control for selected activities to verify compliance with Procedure 30DP-9MT03, "Assessment and Management of Risk When Performing Maintenance in Modes 1-4," Revision 7. 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 inspectors verified that plant configurations allowed by the Plant

Configuration Risk Indicator Matrix were consistent with actual plant conditions during maintenance. The specific activities reviewed were associated with planned and emergent maintenance on:

- January 9, 2003, failure of Valve SGAUV134A position indication described in CRDR 2576766 and corrected using Work Order 2576764 (Unit 2)

- January 24, 2003, elevated reactor coolant system leakage due to coolant charging Pump A discharge relief valve degradation corrected with Work Order 2571607 (Unit 3)

- January 28, 2003, risk assessment for scheduled maintenance of auxiliary feedwater Train B valves (Unit 2)

- January 29, 2003, scheduled online outage for emergency diesel generator, essential spray pond, essential chilled water, essential cooling water, and containment spray Train B (Unit 2)

- February 4, 2003, risk assessment to perform maintenance on startup Transformer NAN-X02 and associated switchyard Breaker PL-948 (Units 1, 2, and 3)

- February 7, 2003, evaluation of risk and actions implemented due to high pressure safety injection Pump B discharge header relief valve and balance of plant engineered safety features actuation system Sequencer B emergent equipment problems (Unit 1)

b. Findings

No findings of significance were identified.

1R14 Personnel Performance During Nonroutine Evolutions (71111.14)

a. Inspection Scope

For the nonroutine evolutions described below, the inspectors reviewed operator logs and plant computer data and/or observed operator performance to determine what occurred, how the operators responded, and whether the response was in accordance with plant procedures:

- On February 7, 2003, inspectors observed performance and response to an unexpected actuation of fuel building essential ventilation signal Train B and control room essential filtration actuation signal Trains A and B. These activities were conducted in accordance with Procedures 40OP-9SA01, "BOP ESFAS Modules Operation," Revision 15, and 41ST-1ZZ02, "Inoperable Power Sources Action Statement," Appendix F, Revision 32. (Unit 1)

- On February 7, 2003, the licensee discovered that leakage from the high pressure safety injection system outside containment that could contain highly radioactive fluids during a serious transient or accident exceeded the safety analysis leak rate limit. The licensee determined that charging to high pressure Safety Injection A header isolation Valve 2PSIA-V811 was the source of the leakage. The valve was replaced using Work Order 2583413 on February 8. (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 were maintained or that Technical Specification Actions were properly entered.

- January 30, 2003, emergency diesel generator Train B output breaker closure permissive setpoints found to be not within expected values during corrective maintenance (Unit 2)

- March 5, 2003, containment entry identified a packing leak on Valve 2PSGEV295 as reported on CRDR 2590059 (Unit 2)

- On February 28, 2003, a vendor identified a problem with an internal plastic part in a Rotork actuator and its applicability to possibly three other valve actuators as reported in CRDR 2589899 (Unit 1)

- On March 5, 2003, related to an oil level increase seen on an emergency diesel generator Train B woodward governor as reported in CRDR 2590368 (Unit 3)

- March 20, 2003, pressurizer spray Valve RCE-PV-100E inlet isolation Valve 3PRCEV240 packing leak as documented in deficiency Work Order 2592792 (Unit 3)

b. Findings

No findings of significance were identified.

1R16 Operator Workarounds (71111.16)

a. Inspection Scope

The inspectors reviewed the control room deficiency log in Units 1, 2, and 3 to determine the number of operator workarounds that existed and the safety significance of existing operator workarounds. The inspectors interviewed operators, shift technical advisors, and work control supervisors. Through the interviews and review of station documents, the inspectors assessed the cumulative effect of the workarounds on the ability of operators to respond in a correct and timely manner to plant transients and emergency response. The inspectors also assessed the adequacy of the compensatory actions for existing workarounds.

b. Findings

No findings of significance were identified.

1R19 Postmaintenance Testing (71111.19)

a. Inspection Scope

The inspectors observed and/or evaluated the results from the following postmaintenance tests to determine whether the test adequately confirmed equipment operability. The inspectors also verified that postmaintenance tests satisfied the requirements of Procedure 30DP-9WP04, "Postmaintenance Retest Development," Revision 13.

- January 8, 2003, Work Order 2577145, retest following repair to water leak on emergency diesel generator Train B lube oil cooler (Unit 1)

- January 29, 2003, various work orders for maintenance performed during emergency diesel generator Train B outage (Unit 2)

- February 26, 2003, Work Order 2587684, retest following repair of control element drive mechanism motor Generator A output Breaker 3JSFNC02A (Unit 3)

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors observed the performance of and/or reviewed documentation for the following surveillance tests. Applicable test data was reviewed to verify whether they met Technical Specification, Updated Final Safety Analysis Report, and licensee procedure requirements. Also, the inspectors verified that the testing effectively

demonstrated that the systems were operationally ready and capable of performing their intended safety functions and that identified problems were entered into the corrective action program for resolution.

- January 30, 2003, Procedure 36MT-9SE14, "Excore Safety Channel Calorimetric Compensation," Revision 24 (Unit 2)
- February 13, 2003, Procedure 73TI-9MT04, "Plant Data Collection For SGR and LP Turbine Replacement," Revision 1 (Unit 2)
- February 19, 2003, Procedure 36ST-2SA03, "ESFAS Train A Subgroup Relay Functional and Response Time Test," Revision 0 (Unit 2)
- February 26, 2003, Procedure 36ST-9SE03, "Excore Safety Linear Channel Quarterly Calibration," Revision 37 (Unit 3)

b. Findings

No findings of significance were identified.

1EP1 Emergency Preparedness (71114.01)

a. Inspection Scope

The inspectors reviewed the objectives and scenario for the 2003 biennial emergency plan exercise to determine if the exercise would acceptably test major elements of the emergency plan. The scenario simulated a security event, a reactor coolant system leak, subsequent loss of reactor coolant and containment integrity, and a fire which resulted in a large, short-term release of radioactive materials to the environment.

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

- 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 March 12, 2003, postexercise critiques in each of the above facilities to evaluate the initial licensee self-assessment of exercise performance. The inspectors also attended the March 13, 2003, preliminary presentation of the exercise evaluation results to plant management. Final plant management evaluation of the

exercise results were given to the inspectors on March 19, 2003, during a telephone conversation between the inspectors and the emergency preparedness manager.

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

The inspectors performed an in-office review of the documents listed below and compared them to their previous revisions, NUMARC/NESP-007, "Methodology for Development of Emergency Action Levels," Revision 2, and 10 CFR 50.54(q) to determine if the revisions decreased the effectiveness of the emergency plan:

- Palo Verde Nuclear Generating Station, Emergency Plan, Revision 27
- EPIP-01, "Satellite Technical Support Center Actions;" Appendix A, "Emergency Action Levels;" and Appendix P, "EAL Technical Bases," Revision 12
- EPIP-02, "Operations Support Center Actions;" Appendix A, "Emergency Action Levels;" and Appendix P, "EAL Technical Bases," Revision 25
- EPIP-03, "Technical Support Center Actions;" Appendix A, "Emergency Action Levels;" and Appendix P, "EAL Technical Bases," Revision 31
- EPIP-04, "Emergency Operations Facility Actions;" Appendix A, "Emergency Action Levels;" and Appendix P, "EAL Technical Bases," Revision 31

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

The inspectors performed an on-site review of the Palo Verde Nuclear Generating Station Emergency Plan, Revision 28, which updated titles, corrected grammatical errors, and added information concerning emergency response organization staffing, security emergency action levels, local law enforcement support, and updated population statistics for the emergency planning zone. Revision 28 was compared to previous revisions of the plan and to the requirements of 10 CFR Part 50, Appendix E, to determine whether the revision decreased the effectiveness of the emergency plan.

b. Findings

No findings of significance were identified.

1EP6 Drill Evaluations (71114.06)

a. Inspection Scope

On February 5, 2003, 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.

4. OTHER ACTIVITIES [OA]

4OA1 Performance Indicator Verification (71151)

.1 Drill and Exercise Performance

a. Inspection Scope

The inspectors reviewed the following documents related to the drill and exercise performance indicator in order to verify the licensee's reported data:

- Drill schedules for calendar year 2002
- Drill and exercise scenarios for a 100 percent sample of drills conducted during the 2nd through 4th quarters of Calendar Year 2002
- Evaluator and participant logs and offsite notification forms for a 100 percent sample of drills conducted during the 2nd through 4th quarters of Calendar Year 2002
- Drill evaluation worksheets
- Performance indicator reports

b. Findings

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

.2 Emergency Response Organization Drill Participation

a. Inspection Scope

The inspectors reviewed the following records related to emergency response organization participation in order to verify the licensee's reported data:

- List of key emergency response organization positions
- Drill participation date summaries for key emergency responders for the 2nd through 4th quarters of Calendar Year 2002
- Emergency response organization rosters for the 2nd through 4th quarters of Calendar Year 2002
- Drill participation records for a sample of eight emergency responders
- Performance indicator reports

b. Findings

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

.3 Alert and Notification System

a. Inspection Scope

The inspectors reviewed a 100 percent sample of siren testing records for the 2nd through 4th quarters of Calendar Year 2002 to verify the accuracy of data reported for this performance indicator.

b. Findings

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

.4 Initiating Events Cornerstone

a. Inspection Scope (Units 1, 2, and 3)

The inspectors reviewed unit logs, plant thermal performance records, monthly operating reports, and licensee event reports from January 2002 to December 2002 for

all three units to verify the accuracy and completeness of data used to calculate and report the following performance indicators:

- Unplanned scrams per 7,000 critical hours
- Scrams with loss of normal heat removal
- Unplanned power changes per 7,000 critical hours

b. Findings

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

4OA5 Other

.1 Temporary Instruction 2515/149: Mitigating Systems Performance Index (MSPI) Pilot Verification (Units 1, 2, and 3)

a. Inspection Scope

The inspectors and the Region IV Senior Reactor Analysts audited the licensee's MSPI data for October 2002 through February 2003. The objective of the audit was to verify that the licensee was correctly implementing the MSPI pilot guidance for reporting unavailability and unreliability as required by temporary instruction (TI) 2515/149. The audit included interviews with the licensee's risk analysts and other technical staff, reviews of operating logs, design basis documents, and equipment history. The inspectors also reviewed monthly reports, maintenance rule reports, CRDRs, Updated Final Safety Analysis Report, system drawings, and the NRC SDP notebook. The inspectors also reviewed the licensee's MSPI spreadsheets and the Reactor Oversight MSPI Pilot Basis Document, which provided a description of the boundaries and active components.

Sections 03.11.a and 03.11.c were not completed as written because the staff did not qualify the licensee's updated PRA for use prior to or during the MSPI pilot. However, the activities conducted by the analysts and the results obtained for these sections are documented in an attachment to this inspection report.

The inspectors reviewed the licensee's treatment of the following systems covered by this pilot:

- high pressure safety injection system
- essential cooling water system
- essential spray pond system

b. Findings

The licensee made a reasonable best effort to provide accurate and complete data for this voluntary pilot program. The specific audit results of TI 2515/149 are documented in Attachment 2.

4OA6 Management Meetings

Exit Meeting Summary

The resident inspectors presented inspection results to Mr. G. Overbeck, Senior Vice President, Nuclear, and other members of licensee management on April 2, 2003.

The inspectors presented the inspection results to Mr. D. Crozier and other members of licensee management during a telephonic exit interview conducted on January 22, 2003.

The inspectors presented the emergency preparedness inspection results to Mr. G. Overbeck, Senior Vice President, Nuclear, and other members of licensee management during a telephonic exit interview conducted on March 20, 2003.

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

ATTACHMENT 1

KEY POINTS OF CONTACT

Licensee

M. Banks, Communications Representative, Palo Verde Communications
T. Barsuk, Senior Coordinator, Emergency Planning
S. Bauer, Section Leader, Regulatory Affairs
D. Carnes, Department Leader, Operations
G. Cerkas, Senior Coordinator, Emergency Planning
P. Crawley, Director, Nuclear Fuels Management
D. Crozier, Program Leader, Emergency Planning
F. Gowers, El Paso Electric
R. Henry, Site Representative, Salt River Project
A. Kranik, Director, Emergency Services Division
B. Lee, Coordinator, Emergency Planning
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D. Mauldin, Vice President, Engineering and Support
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D. Straka, Regulatory Affairs
J. Taylor, Department Leader, Operations
B. Wolfe, Senior Coordinator, Emergency Planning

NRC

D. Votolato, NMSS Intern

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

NUMBER	TITLE	REVISION
40ST-9AF08	Auxiliary Feedwater Pump AFB-P01 Monthly Valve Alignment	2
73DP-9PP01	Thermal Performance Monitoring and Evaluation Process	3
40DP-9OP15	Operator Work Arounds and Discrepancy Tracking	14
40ST-9SI07	High Pressure Safety Injection System Alignment Verification	6

40ST-9DG02	Diesel Generator B Test	20
40OP-9DG01	Emergency Diesel Generator A	23

Drawings

01-M-EWP-001, "P&I Diagram Essential Cooling Water," Revision 29
01-M-SPP-001, "P&I Diagram Essential Spray Pond System," Revision 35
01-M-SPP-002, "P&I Diagram Essential Spray Pond System," Revision 12
01-M-SIP-001, "P&I Diagram Safety Injection & Shutdown Cooling System," Revision 25
01-M-SIP-002, "P&I Diagram Safety Injection & Shutdown Cooling System," Revision 24
01-M-SIP-003, "P&I Diagram Safety Injection & Shutdown Cooling System," Revision 9

Work Orders

2577193	2464105
2511115	2548712
229614	2555498
2540559	

Condition Report/Disposition Requests

2582719	2584029
2584185	2584844
2587397	2587686
2591656	2583410
2591656	

Emergency Plan Implementing Procedures

EPIP-01, "Satellite Technical Support Center Actions," Revision 13
EPIP-02, "Operations Support Center Actions," Revision 26
EPIP-03, "Technical Support Center Actions," Revision 32
EPIP-04, "Emergency Operations Facility Actions," Revision 32
EPIP-08, "Emergency Planning Administration," Revision 10
EPIP-09, "Emergency Plan Implementation for Security Events," Revision 2

Miscellaneous

PVNGS Pre-Fire Strategies Manual, Revision 14

NEI 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 2

Reactor Oversight Program MSPI Pilot Bases Document Palo Verde Nuclear Generating Station dated November 6, 2002

ATTACHMENT 2

TI 2515/149 Mitigating System Performance Index Pilot Verification (Unit 1, Unit 2, and Unit 3)

Inspection Requirements

03.02 Risk Significant Functions

No discrepancies were noted. The licensee correctly identified the risk significant functions for trains within the selected systems.

03.03 Success Criteria

No discrepancies were noted with the licensee's implementation. Each of the above functions had an appropriate success criteria at the train level (none of the reviewed systems had a separable segment below the train level) which were consistent with the licensee's PRA analysis, Technical Specifications, and design basis documentation. The senior reactor analysts reviewed the INEEL Standardized Plant Analysis Risk Model for Palo Verde, Revision 3 (SPAR model) and the Risk-Informed Inspection Notebook for Palo Verde Nuclear Generating Stations, Units 1, 2 and 3, Revision 1 (Risk-Informed Notebook) to determine if they were consistent with the licensee's PRA functional success criteria for the MSPI. This comparison is provided in Table 1.

TABLE 1
Palo Verde
Functional Success Criteria

System	Success Criteria	Applicable Transients	SPAR	Notebook
AFW	One pump, 500 gpm, within 45 minutes	Transients, MSLB, SGTR, SLOCA	AFW-Trans Fault Tree	Table 2
AFW	AF-A, 500 gpm, for 2 hours in Station Blackout	SBO	AFW2 Fault Tree	Blackout not specifically modeled
AFW	One pump, 750 gpm, during ATWS	ATWS	AFW-ATWS Fault Tree	Increased flow rate not modeled
HPSI	One train aligned to hot leg Injection	MLOCA, LLOCA	HCI-INFF	½ MDPs
HPSI	Injection lines to 3 intact cold legs	All Except SGTR, MLOCA, LLOCA	modeled	inconsistent[1]

HPSI	One injection line for RCS makeup	SGTR and RCP Seal Leak	bounded	½ MDPs
HPSI	Sump suction to a running pump	All Recirculation	modeled	½ MDPs
ESP	Spray to DG/EW Header	All	NOTE[5]	Table 2
ECW	Each train flow to SDC HX and EC Chiller	All	not modeled	Table 2[3]
ECW	Train A to RCP Seals	Transients	NOTE[4]	Inconsistent[2]
RHR	One train through heat exchangers and swapover	All	Swapover not modeled	Table 2 [1]
EDG	Onsite Electric Power for 24 hours	All	modeled	Table 2

[1]Notebook only says ½ trains
[2]Not modeled in notebooks
[3]Notebook does not address flow paths
[4]Not modeled, only basic event for no cooling (RCS-MDP-LK-SEALS)
[5]System and check valves modeled
ESP-MDP-**-A
ESP-MDP-**-B
ESP-CKV-**-**

03.04 Unreliability Boundary Definitions

No discrepancies were noted with the licensee's implementation. The inspectors confirmed that the licensee's definition of the system/train boundaries and the identification of active components was in accordance with the guidance.

Additionally, the senior reactor analysts reviewed the INEEL Standardized Plant Analysis Risk Model for Palo Verde, Revision 3 (SPAR model) and the Risk-Informed Inspection Notebook for Palo Verde Nuclear Generating Stations, Units 1, 2 and 3, Revision 1 (Risk-Informed Notebook) to determine if they were complete and consistent with the licensee's list of active components for the MSPI. This comparison is provided in Table 2.

TABLE 2
Palo Verde
Active Components

System /Train	Component	Function	SPAR Basic Event	Notebook Location
AFW	Pump AFA-P01	Secondary Makeup Pump	AFW-MDP-**-A	Table 2
	Pump AFB-P01	Secondary Makeup Pump	AFW-MDP-**-A	Table 2
	Pump AFN-P01	Secondary Makeup Pump	AFW-MDP-**-A	Table 2
	Valve CTA-HV001	Suction Valve for Pump AFN-P01	AFW-MOV-CC-HV001	Table 2 [6]
	Valve CTA-HV004	Suction Valve for Pump AFN-P01	AFW-MOV-CC-HV004	Table 2 [6]
HPSI A	Pump SIA-P02	Injection Pump	HPI-MDP-**-A[3]	Table 2
	Valve SIA-UV673	Sump Suction	HPR-MOV-CC-673	Table 2
	Valve SIA-UV674	Sump Suction	HPR-MOV-CC-674	Table 2
	Valve SIA-UV617	Cold Leg Injection	HPI-MOV-CC-617	Table 3.*[45]
	Valve SIA-UV627	Cold Leg Injection	HPI-MOV-CC-627	Table 3.*[45]
	Valve SIA-UV637	Cold Leg Injection	HPI-MOV-CC-637	Table 3.*[45]
	Valve SIA-UV647	Cold Leg Injection	HPI-MOV-CC-647	Table 3.*[45]
	Valve SIA-HV698	Hot Leg Injection	Not Modeled[1]	Not Modeled[2]
	Valve SIA-HV604	Hot Leg Injection		NOTE[5]
	Valve SIA-HV321	Hot Leg Injection		NOTE[5]
HPSI B	Pump SIB-P02	Injection Pump	HPI-MDP-**-B[3]	Table 2
	Valve SIB-UV675	Sump Suction	HPR-MOV-CC-675	Table 2

	Valve SIB-UV676	Sump Suction	HPR-MOV-CC-676	Table 2
	Valve SIB-UV616	Cold Leg Injection	HPI-MOV-CC-616	Table 3.*[45]
	Valve SIB-UV626	Cold Leg Injection	HPI-MOV-CC-626	Table 3.*[45]
	Valve SIB-UV636	Cold Leg Injection	HPI-MOV-CC-636	Table 3.*[45]
	Valve SIB-UV646	Cold Leg Injection	HPI-MOV-CC-646	Table 3.*[45]
	Valve SIB-HV699	Hot Leg Injection	Not Modeled[1]	Not Modeled[2]
	Valve SIB-HV609	Hot Leg Injection		NOTE[5]
	Valve SIB-HV331	Hot Leg Injection		NOTE[5]
RHR A	Pump SIA-P03	Injection Pump	CSR-MDP-**-A	Table 2
	SIA-UV672	Hot Leg Injection	CSR-MOV-CC-672	
	SIA-UV673	Containment Sump Suction	HPR-MOV-CC-673	Not Modeled
	SIA-UV674	Containment Sump Suction	HPR-MOV-CC-673	Not Modeled
RHR B	Pump SIB-P03	Injection Pump	CSR-MDP-**-B	Table 2
	SIB-UV671	Hot Leg Injection	CSR-MOV-CC-672	
	SIB-UV675	Containment Sump Suction	HPR-MOV-CC-673	Not Modeled
	SIB-UV676	Containment Sump Suction	HPR-MOV-CC-673	Not Modeled
EDG-01	PEAG01	Emergency Onsite AC	EPS-DGN-**-DGA	Table 2
EDG-02	PEBG01	Emergency Onsite AC	EPS-DGN-**-DGB	Table 2

[1]Hot Leg Injection is not modeled in SPAR
[2]Hot Leg Injection not discussed in Risk-Informed Notebook
[3]The "**" is replaced by FS, FR, TM (one each)
[4]The "*" is replaced by various SDP worksheet numbers
[5]Valves not specifically addressed, trains only
[6]Valves only listed as system "MOVs"

03.05 Train/Segment Unavailability Boundary Definition

No discrepancies were noted. The licensee appropriately defined the scope of the trains being monitored for Unavailability within the selected systems.

03.06 Entry of Baseline Data - Planned Unavailability

No discrepancies were noted.

03.07 Entry of Baseline Data - Unplanned Unavailability

No discrepancies were noted.

03.08 Entry of Baseline Data - Unreliability

No discrepancies were noted.

03.09 Entry of Performance Data - Unavailability

No discrepancies were noted.

03.10 Entry of Performance Data - Unreliability

Minor discrepancies were noted. Specifically, the inspectors identified that the licensee had omitted the failure of Valve 3JSIAHV0698 as an entry for the performance data. The licensee generated CRDR 2571819 and corrected the item.

03.11 MSPI Calculation

The analysts reviewed the licensee's MSPI basis documents and spreadsheets to determine the validity of the Fussell-Vesely coefficients used in the MSPI calculation. The following observations were made:

- The staff did not qualify the licensee's updated PRA for use prior to or during the MSPI pilot. Therefore, these line items could not be performed as written.
- All Fussell-Vesely coefficients were greater than zero, indicating that the associated components or trains were modeled in the licensee's PRA.
- A review of a sample of coefficients for each site indicated that the relative significance of the components and/or trains were in keeping with their expected relative risk significance.
- Most Fussell-Vesely coefficients were too small to verify using hand calculations because the associated core damage frequencies were equal out to 4 significant digits.

- Based on a sample of coefficients, large enough to verify using hand calculations, the Fussell-Vesely coefficients provided by the licensee were consistent with those produced by the licensee's model of record.

- Based on a sample of coefficients, the SPAR model results were within a factor of 2 of the Fussell-Vesely coefficients provided by the licensee.

No discrepancies were noted in the licensee's performance.

LIST OF ACRONYMS USED

AFW	auxiliary feedwater
ATWS	anticipated transient without scram
CKV	check valve
CSR	containment spray recirculation
DGN	diesel generator
ECW	essential cooling water
EDG	emergency diesel generator
EPS	electric power system
FTR	failure to run
FTS	failure to start
HPI	high pressure injection
HPSI	high pressure safety injection
HPR	high pressure recirculation
HX	heat exchanger
INEEL	Idaho National Engineering and Environmental Laboratory
LLOCA	large-break loss of coolant accident
LECH	loss of essential chilled water
LOOP	loss of offsite power
M/D	motor-driven
MLOCA	medium-break loss of coolant accident
MDP	motor-driven pump
MOV	motor-operated valve
MSLB	main steam line break
MSPI	mitigation systems performance indicator
PRA	probabilistic risk assessment
RCP	reactor coolant pump
RCS	reactor coolant system
RHR	residual heat removal system
SBO	station blackout
SDC	shutdown cooling
SDP	significance determination process
SLOCA	small-break loss of coolant accident
SGTR	steam generator tube rupture
SI	safety injection
TM	test and maintenance