UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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October 11, 2006

EA-04-221

James M. Levine, Executive
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SUBJECT: PALO VERDE NUCLEAR GENERATING STATION - NRC FOLLOWUP SUPPLEMENTAL INSPECTION REPORT 05000528/2006010; 05000529/2006010; AND 05000530/2006010

Dear Mr. Levine:

On August 11, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed a followup supplemental inspection using Inspection Procedure 95002, "Inspection For One Degraded Cornerstone Or Any Three White Inputs In A Strategic Performance Area," at the Palo Verde Nuclear Generating Station. The enclosed report documents the results of the inspection, which were discussed on September 1, 2006, with you and other members of your staff.

As described below, the NRC determined that the Yellow finding will remain open because the corrective actions taken in response to the root causes and related programmatic concerns involving questioning attitude, technical rigor, and operability determinations have not been fully effective. Also, we have determined that the performance monitoring measures (e.g., metrics) necessary to fully assess the effectiveness of the corrective actions did not take into account all the relevant data.

The previous Inspection Procedure 95002 supplemental inspection was completed on December 12, 2005. The specific purposes of the inspection were: (1) provide assurance that the root causes and contributing causes for the violations, which resulted in the degraded cornerstone, were understood; (2) independently assess the extent of condition and extent of cause for the violations; and (3) provide assurance that your planned corrective actions were sufficient to address the root causes and contributing causes for the violations and to prevent their recurrence.

As detailed in NRC Supplemental Inspection Report 05000528/2005012; 05000529/2005012; and 05000530/2005012, the NRC had concluded in this previous inspection that not all corrective actions were sufficiently developed to ensure that the identified performance deficiencies were adequately addressed and that reviews were not established to ensure that

corrective actions were effective in improving performance. Consequently, the subject design control violation in the mitigating systems cornerstone remained open pending completion of the followup inspection activity.

On April 15, 2006, you informed us in writing that sufficient progress was being made and that re-inspection of the design control performance deficiencies could occur in June 2006. In July 2006, we initiated a followup supplemental inspection to determine if your corrective actions associated with the design control violation were sufficient to address the root causes and contributing causes.

Consistent with NRC Inspection Procedure 95002, in order to determine if the remaining aspects of the Yellow finding could be closed, the followup supplemental inspection team assessed the adequacy of the corrective actions implemented by the facility and evaluated the effectiveness of measures and metrics used to monitor performance improvement. As detailed below, the team determined that Sections 02.03a (Determine that appropriate corrective actions are specified for each root/contributing cause) and 02.03b (Determine that measures of success have been developed for determining the effectiveness of corrective actions) of NRC Inspection Procedure 95002 were not satisfied.

Specifically, the corrective actions, involving questioning attitude, technical rigor, and technical review have not been completely effective. Following implementation of corrective actions between September 2005 and March 2006, you continued to conduct inadequate technical reviews of emerging issues; did not routinely question the validity of engineering assumptions used to support operability decisions; did not consistently implement a qualify, validate, and verify process; and did not consistently notify operations personnel of immediate operability concerns.

Additionally, we concluded that you have not established adequate qualitative or quantitative measures for determining the effectiveness of the corrective actions associated with the Yellow design control finding. For example, not all relevant data was considered when performance monitoring measures were developed to assess the effectiveness of corrective actions. When the pertinent data was considered, or otherwise clarified, the performance measures suggested declining rather than improving performance in some areas.

Accordingly, we have concluded that the Yellow finding will remain open until you have implemented effective corrective actions for concerns involving questioning attitude, technical rigor, and technical review; and you have developed and implemented performance measures and metrics to monitor and adjust corrective actions associated with the Yellow design control finding. We also request that you inform us in writing once you have completed steps to ensure that your corrective actions are of sufficient scope and breadth to address the subject performance deficiencies. The NRC will then schedule and perform additional inspections to assess the effectiveness of your actions and determine if measures have been implemented to monitor the effectiveness of the actions associated with the Yellow finding.

During the September 7, 2006, public meeting, you indicated that success measures would be developed for NRC review prior to your request for an additional NRC assessment of the Yellow finding. At a minimum, the success measures should specify the remaining corrective actions needed to improve questioning attitude, technical rigor, and technical review. Additionally, the

success measures should specify the assessments, measures, and metrics necessary to monitor the effectiveness of corrective actions associated with the Yellow finding root and contributing causes.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) 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/

Bruce S. Mallett
Regional Administrator

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

Enclosure:
NRC Inspection Report 05000528/2006010;
05000529/2006010; and 05000530/2006010
w/Attachment: Supplemental Information

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SUNSI Review Completed: TWP ADAMS: ☐ Yes ☐ No Initials: TWP
X Publicly Available ☐ Non-Publicly Available ☐ Sensitive X Non-Sensitive

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Dockets:	50-528; 50-529; 50-530
Licenses:	NPF-41; NPF-51; NPF-74
Report:	05000528/2006010; 05000529/2006010; 05000530/2006010
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 24 through August 11, 2006
Inspectors:	M. Hay, Senior Project Engineer, Projects Branch D M. Sitek, Resident Inspector, Projects Branch D G. Warnick, Senior Resident Inspector, Projects Branch D
Approved By:	Bruce S. Mallett Regional Administrator

SUMMARY OF FINDINGS

IR 05000528/2006010; 05000529/2006010; 05000530/2006010; 07/24/06 - 08/11/06; Palo Verde Nuclear Generating Station, Units 1, 2, and 3; Followup Supplemental Inspection Report; Inspection Procedure 95002.

This report documents a followup supplemental inspection by a senior resident inspector, a senior project engineer, and a resident inspector. 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. NRC-Identified Findings:

Cornerstone: Mitigating Systems

- N/A. The NRC performed a followup supplemental inspection to assess the licensee's corrective actions associated with a Yellow design control finding involving the potential for air entrainment into the emergency core cooling system. The team concluded that the technical issues specifically associated with the voided emergency core cooling system piping have been addressed. However, the Yellow finding will remain open because the licensee did not implement effective corrective actions for all of the causes associated with the Yellow finding. Specifically, the licensee's actions to improve questioning attitude, technical rigor, and technical review were not fully effective. Also, the implementation of performance measures and metrics to monitor the effectiveness of corrective actions associated with the Yellow finding were not adequate to assess effectiveness. This performance issue was previously characterized as a 10 CFR Part 50, Appendix B, Criterion III, violation having substantial safety significance (Yellow), and was originally identified in NRC Inspection Report 05000528; 05000529; 05000530/2004014.

  The licensee's corrective actions taken in response to the root causes and related programmatic concerns involving questioning attitude, technical rigor, and technical review have not been completely effective. Specifically, following implementation of corrective actions between September 2005 and March 2006, the licensee: (1) continued to conduct inadequate technical reviews of emerging issues; (2) did not routinely question the validity of engineering assumptions used to support operability decisions; (3) did not consistently implement a qualify, validate, and verify process; and (4) did not consistently notify operations personnel of immediate operability concerns.

  The team concluded that adequate qualitative or quantitative measures for determining the effectiveness of the corrective actions to prevent recurrence have not been established. For example, not all relevant performance data was considered when performance monitoring measures were developed to assess the effectiveness of corrective actions. When the pertinent data was considered, or otherwise clarified, the performance measures suggested declining rather than improving performance in some areas.

The team also concluded that the licensee had not completed adequate reviews of the effectiveness of corrective actions prior to their notifying the NRC of their readiness for inspection of the Yellow finding. Specifically, several assessments were completed after the requested dated of the inspection (June 2006). Several of the assessments noted that insufficient progress in resolving some of the root and contributing causes had been made. Additionally, a standard guideline for metrics was not issued and implemented until July 2006.

REPORT DETAILS

01 INSPECTION SCOPE

In August 2004, the U.S. Nuclear Regulatory Commission (NRC) identified a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," that involved a failure to adequately control the design configuration of the containment sump safety injection suction piping at all three Palo Verde Nuclear Generating Station (PVNGS) units. Specifically, a significant portion of this piping was not consistently maintained full of water since initial operation of all three units. The finding was originally documented in NRC Inspection Report 05000528; 05000529; 05000530/2004014. This violation was subsequently determined to be of substantial safety significance (Yellow) through the application of NRC Manual Chapter 0609, "Significance Determination Process," and is related to the mitigating systems cornerstone in the reactor safety strategic performance area.

The NRC completed a supplemental inspection (NRC Inspection Report 05000528; 05000529; 05000530/2005012) on December 12, 2005, to assess the licensee's evaluation and corrective actions associated with potential air entrainment into the emergency core cooling system (ECCS). The NRC team concluded that not all corrective actions were sufficiently developed to ensure that the identified performance deficiencies were adequately addressed. Also, criteria and reviews were not established to ensure that corrective actions were effective in improving performance in the affected areas. Therefore, the Yellow finding (Violation 05000528; 05000529; 05000530/2004014-01) remained open pending further NRC review.

On April 15, 2006, the licensee informed the NRC in writing that significant progress on the corrective actions associated with the Yellow finding would be completed in time to support a June 2006 followup inspection. Furthermore, the licensee communicated that a performance improvement model was being used to identify and monitor corrective actions for effectiveness in order to make necessary improvements if the intended results were not achieved. As part of the preparations for the July 2006 followup inspection, the licensee developed a concept for assuring the bases for not closing the Yellow finding were reviewed and understood. The licensee also ensured that actions were taken to resolve the voided pipe condition and lessons learned were noted and applied to improve performance. To accomplish these items, the causal factors from the significant investigation were grouped by focus areas as follows:

- Focus Area 1, "Procedures Did Not Contain Necessary Requirements"
- Focus Area 2, "Lack of Specific Provisions in the Design and Licensing Basis"
- Focus Area 3, "Lack of Questioning Attitude and Technical Rigor of Individuals"
- Focus Area 4, "Inadequate Communication of Design Information"
- Focus Area 5, "Inadequate Problem Identification and Resolution"
- Focus Area 6, "Limited or Weak Operating Experience Program"
- Focus Area 7, "Limited Experience and Training"
- Focus Area 8, "Limited Resources"
- Focus Area 9, "Limited Nuclear Assurance Department Oversight"
- Focus Area 10, "Limited Procedural Guidance"

Additionally, implementation of corrective actions were verified to appropriately address each of the causal factors contained in each focus area; lessons learned were translated into a broader problem statement or learning statements with action plans identified for continued improvement; and effectiveness measures were identified and developed for each of the focus areas.

Consistent with Section 02.03 of NRC Inspection Procedure 95002, the NRC performed a followup supplemental inspection to determine if: (a) appropriate corrective actions were specified for each root/contributing cause or that there was an evaluation that no actions were necessary; (b) the corrective actions had been prioritized with consideration of the risk significance and regulatory compliance; (c) a schedule had been established for implementing and completing the corrective actions; and (d) quantitative or qualitative measures of success had been developed for determining the effectiveness of the corrective actions to prevent recurrence. Specific items reviewed by the followup inspection team are documented in the attachment or in the following discussions of NRC observations.

02 EVALUATION OF INSPECTION REQUIREMENTS

02.03 Corrective Actions

a. Appropriateness of Corrective Actions for Each Root or Contributing Cause

.1 Focus Area Reviews

Focus Area 1: Procedures Did Not Contain Necessary Requirements

The licensee developed Focus Area 1 to include Direct Cause 1, "Procedures Did Not Contain Necessary Requirements." The team reviewed the corrective actions pertaining to the licensee's identified direct cause associated with the failure to maintain the containment sump suction piping full of water in accordance with facility design requirements (Yellow finding). The direct cause involved procedural guidance failing to contain necessary requirements to ensure the design intent of keeping the lines filled was maintained. To maintain the piping full, the licensee implemented permanent plant modifications that installed vent and drain valves and a fill header associated with each containment sump suction line, and replaced carbon steel with stainless steel for those valve components subjected to a borated water environment. The team reviewed the plant modifications and changes made to applicable start-up, surveillance, and operating procedures, and determined that they were acceptable for ensuring that the associated piping would remain full of water for all operating modes requiring operability of the ECCS and containment spray (CS) system.

Focus Area 2: Lack of Specific Provisions in the Design and Licensing Basis

The licensee developed Focus Area 2 to include Root Causes 1 and 4, both entitled "Lack of Specific Provisions in the Design and Licensing Basis"; Contributing Cause 1, "Inappropriate Reliance on Standard CE Design"; and Contributing Cause 7, "Limited

Verification and Validation." Corrective actions included, in part: (1) revision to the Design Basis Manual for the safety injection system to document the requirement to fill ECCS suction lines; (2) revision to Updated Final Safety Analysis Report (UFSAR), Section 6.3.2.6, to add a new paragraph to indicate the need to have the ECCS lines (including the suction lines) filled to ensure proper operation of the CS and high pressure safety injection pumps, (3) evaluations to determine the need for revisions to other affected sections of the UFSAR and other affected licensing documents; and (4) revision to the Technical Requirements Manual to include a requirement to periodically verify that the ECCS sump suction lines are filled. The team reviewed the actions associated with this focus area and determined that the corrective actions specified by the licensee were appropriately implemented or the planned completion date was commensurate with the safety significance of the issue. Therefore, the team determined that this focus area could be closed.

Focus Area 3: Lack of Questioning Attitude and Technical Rigor of Individuals

The licensee developed Focus Area 3 to include Root Causes 2 and 5, both entitled "Lack of Questioning Attitude of Individuals," and Root Cause 8, "Less Than Adequate Technical Reviews." See Section 02.03.a.2 for the team's observations and evaluation.

Focus Area 4: Inadequate Communication of Design Information

The licensee developed Focus Area 4 to include Root Cause 3, "Inadequate Communication of Design Information (IDR)," and Root Cause 6, "Inadequate Communication of Design Information (CE Letters)." Corrective actions included, in part: (1) a case study to emphasize to engineering, operations, nuclear assurance, and regulatory affairs personnel, the need for proper communication of information; (2) revisions to the operating experience (OE) program; (3) review of Independent Design Reviews performed prior to plant startup to determine if items impacting the design, license, or procedures were not incorporated into design document requirements; and (4) a review to determine if there were other instances of design and/or licensing commitments being identified and discussed in OE that were not translated into design documents. The team reviewed the actions associated with this focus area and determined that the corrective actions specified by the licensee were appropriately implemented or the planned completion date was commensurate with the safety significance of the issue. Therefore, the team determined that this focus area could be closed.

Focus Area 5: Inadequate Problem Identification and Resolution

The licensee developed Focus Area 5 to include Root Cause 7, "Inadequate Problem Identification and Resolution." The team determined that the licensee had implemented previous corrective actions to add structure to the engineering review process. Specifically, (1) Procedure 90AC-0IP04, “Condition Reporting,” Revision 1, was revised in 1994 to expand the use of Condition Report/Disposition Requests (CRDRs) to include requests for technical clarifications and evaluations, which were previously captured under the engineering evaluation request process; (2) in 1997, the instruction change request process was discontinued for use by personnel to request information; and (3) in 2005, a sampling of engineering evaluation requests affecting the auxiliary

feedwater, emergency diesel generator (EDG), and safety injection systems were reviewed to identify any licensing or design configuration changes which could adversely impact a safety function. The team reviewed the actions associated with Focus Area 5 and determined that the licensee completed appropriate corrective actions for the items specific to the Yellow finding.

The team observed that the licensee identified the following problem statement associated with the extent of cause for Focus Area 5: "Inadequate implementation of the Corrective Action Program (CAP) resulted in inconsistent problem identification, narrowly focused evaluations, and ineffective and untimely issue resolution." The licensee conducted a root cause investigation of the CAP under CRDR 2780286. The team concluded that the licensee's actions to date have not been effective in correcting the deficiencies in this area based on the number and type of issues discussed in Section 02.03.a.2 that directly related to inadequate problem identification, evaluation, and resolution. The team noted that a recovery plan was in progress as directed by the Performance Improvement Department to address several aspects of an NRC identified problem identification and resolution substantive crosscutting issue. The licensee recognized that they had not made the necessary improvements as indicated by a majority of red windows in the CAP and Human Performance Health Reports (June/July 2006). The licensee also recognized that the primary issue with the CAP was implementation of the program. However, there was no measurement of deficiencies associated with CAP implementation until identified by the team during this followup inspection. The licensee initiated CRDR 2913447 and developed new metrics to measure the effectiveness of CAP implementation. The new metrics for CAP implementation included the failure to initiate a CAP document, failure to evaluate an adverse or significant condition, and closure of a CAP document without resolving the condition.

Focus Area 6: Limited or Weak Operating Experience Program

The licensee developed Focus Area 6 to include Root Cause 9, "Limited Operating Experience Program (Topical Reports and Tracking Trends)," and Contributing Cause 4, "Weak Operating Experience Program (Generic)." The team reviewed the actions associated with this focus area and observed that the licensee's long term corrective actions were to improve the screening, analysis, and communication of new or incoming OE. The team noted that there were no corrective actions to address the routine use of OE in the licensee's day-to-day activities. Both the Yellow finding and the Green NCV associated with the refueling water tank vortex issue (Inspection Report 05000528; 05000529; and 05000530/2005012) involved missed opportunities associated with the effective use of OE during the operability determination (OD) process. The team reviewed CRDR 2835132, which was generated to address the refueling water tank vortex Green noncited violation (NCV), and noted that the licensee failed to identify any applicable OE associated with the issue. However, during the initial supplemental inspection, the NRC brought applicable OE associated with uncovering the refueling water tank vortex breaker to the licensee's attention as described in Section 4OA5.1 of Inspection Report 05000528; 05000529; and 05000530/2005012. In response to the followup teams observation, the licensee generated CRDR 2913790 to address this issue. The team determined that with the exception of the use of OE in daily activities (e.g., application of OE to the review of emergent issues) the licensee's corrective

actions were appropriately implemented or the planned completion date was commensurate with the safety significance of the issue. Corrective actions associated with the use of OE in daily activities will be reviewed as part of the NRC's continued assessment of Focus Area 3.

Focus Area 7: Limited Experience and Training

The licensee developed Focus Area 7 to include Contributing Cause 2, "Limited Experience and Training (Start-up Engineering)," and Contributing Cause 5, "Limited Experience and Training (Engineering)." The team reviewed the actions associated with this focus area and noted that one of the corrective actions was to perform a knowledge analysis of incumbent engineers. The team reviewed Attachment 3 of Procedure 73TD-0ZZ03, "System Engineering Handbook," Revision 4, which contained the analysis documentation form. The team noted that it consisted of a "yes/no" questionnaire that asked system engineers if they were comfortable with the knowledge they had on their assigned system in various areas such as licensing basis, design basis, Technical Specifications, drawings, and the maintenance rule. The analysis was dependent on engineers' opinion of their knowledge base. As a result, the potential existed for needed training to be missed. An example of the limits of this analysis tool involved the spray pond issue discussed in Section 02.03.a.2. The system engineer had knowledge gaps in the design basis and provided incorrect information to the control room. The engineer completed his analysis form after that event and marked "no" in the area of system design basis. The team asked the focus area owner what he thought the engineer would have checked before the event and he indicated that the engineer probably would have selected "yes" in that area. The licensee agreed that the analysis of incumbent engineers was weak and developed a more thorough and comprehensive analysis tool. The new tool included questions that solicited more detailed information on the level of an individual's knowledge of various engineering topics. The efficacy of that tool was not assessed by the team because it was implemented after the inspection was completed. Notwithstanding this issue, the team's review of the licensee's corrective actions associated with this focus area determined that the corrective actions were appropriately implemented or the planned completion date was commensurate with the safety significance of the issue. The team determined that the licensee's actions resulted in a small number of new performance deficiencies in this focus area. The team concluded that this focus area could be closed.

Focus Area 8: Limited Resources

The licensee developed Focus Area 8 to include Contributing Cause 3, "Limited Resources (Start-up Engineering)," and Contributing Cause 6, "Limited Resources (SI System Engineering)." Corrective actions included, in part: (1) assessing staffing needs; (2) defining the roles and responsibilities of each engineering group; and (3) developing a long range staffing plan. Following development of the staffing plan, the licensee hired approximately 40 personnel to augment various sections of the engineering department. The team reviewed the actions associated with this focus area and determined that the corrective actions specified by the licensee were appropriately implemented or the planned completion date was commensurate with the safety significance of the issue. Therefore, the team determined that this focus area could be closed.

Focus Area 9: Limited Nuclear Assurance Department Oversight

The licensee developed Focus Area 9 to include Contributing Cause 9, "Limited NAD Oversight." Corrective actions included, in part, a revision to the auditing procedure (Procedure 60DP-0QQ19) to ensure that: (1) audit scopes included provisions for an in-depth review of Technical Specifications for the area being audited; (2) audits that perform indepth reviews include personnel with the appropriate engineering or operational expertise; and (3) the underlying concerns surrounding the voiding issues are discussed in each audit prejob briefing. The team reviewed the actions associated with this focus area and determined that the corrective actions specified by the licensee were appropriately implemented or the planned completion date was commensurate with the safety significance of the issue. Therefore, the team determined that this focus area could be closed.

Focus Area 10: Limited Procedural Guidance

The licensee developed Focus Area 10 to include Contributing Cause 8, "Limited Procedural Guidance." Corrective actions included, in part: (1) communication of limitations of Design Basis Manuals to all users, including the requirement to verify information by referring to source documents; and (2) a revision to the design and technical document control procedure to require personnel changing or adding a reference to a Design Basis Manual to adequately review the reference document. The team reviewed the actions associated with this focus area and determined that the corrective actions specified by the licensee were appropriately implemented or the planned completion date was commensurate with the safety significance of the issue. Therefore, the team determined that this focus area could be closed.

.2 Corrective Action Effectiveness for Focus Area 3

The team noted that Focus Area 3 contained a problem statement of, "Ineffective use of error prevention tools and management oversight is illustrated by errors related to technical rigor, questioning attitude, procedure use and adherence, and decision making tools." With respect to ineffective questioning attitude and technical rigor, the licensee documented, "Some PVNGS personnel had a narrow focus and an incorrect mindset in reviewing information provided in various design documents that indicated the need to keep the ECCS suction lines filled. There was a general ineffective use of a "Qualify, Validate, and Verify," (QV&V) process. QV&V is a three step tool used to obtain accurate information during critical decision-making." With respect to less than adequate technical reviews, the licensee documented, "As a result of inadequate technical reviews, PVNGS personnel overlooked information regarding the need to fill the ECCS suction lines or did not review identified issues that could have led to identification of the unanalyzed condition involving the suction lines."

Significant investigation CRDR 2726509, Revision 2, Supplement 1, Section 9.0, "Corrective Actions," stated that, "The corrective actions below [corrective action matrix] provide a comprehensive strategy to improve questioning attitude and technical rigor at Palo Verde. The strategy includes long term actions to anchor questioning attitude in

the personal behaviors and the culture at Palo Verde. Pending completion of the longer term actions to address the causes and organizational issues, PVNGS has taken or will shortly take interim actions to provide additional assurance that ongoing activities are properly performed."

The team reviewed the corrective actions implemented by the licensee to address this focus area. A number of actions were implemented between September 2005 and March 2006. These actions included: (1) senior management communicating to all employees that a lack of questioning attitude and technical rigor was one of the root causes of the Yellow finding; (2) engineering management communicating to all engineering personnel that a lack of questioning attitude and technical rigor was one of the root causes for the Yellow finding and that engineering personnel were expected to especially question and QV&V all information when interfacing with operations; (3) the operations director communicating to all operations personnel that a lack of questioning attitude and technical rigor was one of the root causes for the Yellow finding and that operations personnel should especially question and QV&V all information pertaining to the operability determination process, Technical Specification compliance, equipment troubleshooting activities, and engineering interface activities; (4) developing a plan to improve and anchor the organizational culture with respect to effective questioning attitude and technical rigor; (5) implementing a media campaign (posters, company email, etc.) to communicate the need for improving questioning attitude and increased technical rigor; (6) training to the organization to emphasize how the Yellow design control issue escaped detection for over 20 years because of ineffective questioning attitude and technical rigor, incorrect mindsets, and tunnel vision; (7) issuing a new site "Expectations and Standards Booklet" to include expectations regarding questioning attitude and use of the QV&V process; and (8) developing a site-wide conservative decision-making model to include provisions for engineering decisions.

The team reviewed the effectiveness of the corrective actions since there were several recent performance deficiencies reflective of poor performance in this focus area. Of particular concern was that a number of these deficiencies were discovered through NRC questioning. The team noted that the failure to self-identify these performance deficiencies was of concern since corrective action effectiveness measures may not be representative of actual performance (Section 02.03.d). Findings associated with the performance deficiencies were documented in NRC Special Inspection Report 05000528; 05000529; 05000530/2006011. The following examples of performance deficiencies involving ineffective questioning attitude, technical rigor, and technical reviews were discussed with the licensee:

- During a surveillance test of Unit 2 EDG Train B on May 17, 2006, high out of specification intercooler air temperatures were noted. Operations personnel discussed this condition with the system engineer, who verbally assured the shift manager that the EDG was operable. Neither an immediate OD or CRDR were initiated before the Unit 2 Train A EDG was removed for maintenance on May 18, 2006, for approximately 23 hours of scheduled unavailability. On May 19, 2006, Work Order 2896333 was initiated to inspect and clean the Train B EDG intercoolers. During a review of this work order, following the restoration of the Train A EDG, onshift operations personnel determined the high intercooler temperatures warranted an OD and entry into the CAP. The licensee

generated CRDR 2896661 on May 19, 2006, to address the abnormal temperature condition. After initial review of the CRDR by operations personnel, the EDG was determined to remain operable. This decision was based on informal information obtained by the system engineer through telephone conversations with a subject expert. The basis for operability assumed that excess diesel engine margin (117 percent) was sufficient to overcome the higher intercooler temperatures. Upon questioning by the NRC, the licensee was unable to provide supporting documentation for this assumption. The team noted that engineering personnel did not utilize an effective questioning attitude and that they did not recognize that the condition required an immediate operability evaluation and entry into the CAP. This example illustrated an ineffective use of the QV&V process in obtaining critical decision making information associated with available margins, and operations personnel not questioning engineering statements to ensure their validity.

- The licensee evaluated the elevated EDG intercooler air temperature condition with CRDR 2896661 and concluded the condition was isolated to the Unit 2 Train B EDG. The inspectors reviewed the evaluation and associated data for the remaining EDGs and determined that they also had elevated intercooler temperatures. Further, the fouling was related to water chemistry control problems in the spray pond system, which also cooled the essential cooling water heat exchangers. These heat exchangers were each taken out of service that same week to remove fouling that was known to exist. Because the cause and extent of condition had not been evaluated, the connection to the EDG elevated intercooler temperature condition was not recognized. The inspectors noted that the licensee's EDG operability evaluation used existing conditions instead of the more limiting design basis conditions, and that this degradation could potentially exceed the design basis temperature limit during accident conditions.

  On May 24, 2006, following these observations and prompting from NRC inspectors, the licensee added corrective action items to CRDR 2896661 to evaluate the original EDG operability decision, evaluate the reportability impact, and evaluate the potential for fouling to affect all site EDGs. The team noted that CRDR 2898120 stated, in part, "It appears that trending and monitoring and/or extent of condition considerations of the essential cooling water heat exchanger fouling condition should have provided for identification of the intercooler fouling condition and prevented the emergent condition discovered on May 17, 2006. It also appears that previous evaluations of higher than normal air intake temperatures by engineering did not take into account the impact of design basis accident maximum spray pond cooling water temperature." The team determined that this example involved inadequate questioning attitude and technical rigor which resulted in the licensee's failure to promptly recognize and fully evaluate the extent of condition aspects of the degraded condition and the potential impact during design basis accident conditions.

- On June 3, 2006, the licensee issued a prompt operability determination after identifying fouling of the essential cooling water and EDG heat exchangers because of inadequate spray pond chemistry controls. The inspectors reviewed

this evaluation and noted that the licensee determined that the heat exchangers were adversely affected by a low temperature fouling mechanism based on their engineering judgment. The inspectors questioned the validity of this assumption and requested documentation that would support operability. The licensee was unable to identify any documentation or data that supported the low temperature fouling mechanism. Subsequently, the licensee determined this assumption was made in error and performed an additional analysis to support operability. The team determined that this example involved ineffective questioning attitude and technical rigor because personnel did not utilize the QV&V process to ensure information used for critical decision making activities was appropriate.

- On June 10, 2006, following NRC questions, the licensee recognized the failure to implement routine preventive maintenance tasks to remove biological fouling agents, corrosion products, and sediment from the ECCS ponds. The concern was documented in CRDR 2901737 and determined to not meet the procedural requirements for contacting the control room operators as an operability concern based on the decision that the failure to implement this task only affected the preventive maintenance process. The inspectors determined that this issue should have been reviewed by the control room operators in accordance with procedural requirements since the failure to remove debris from the ponds could adversely affect the safety function of the ultimate heat sink based on water displacement and heat transfer considerations. The team concluded that the reviewers of the CRDR lacked an effective questioning attitude and demonstrated poor technical review in that this condition was not identified as a potential operability concern affecting the ultimate heat sink and EDGs.

- On June 10, 2006, NRC inspectors discussed with the licensee concerns that sediment buildup of the essential water spray ponds could potentially affect operability of the ultimate heat sink. On June 21, 2006, engineering personnel provided the inspectors a calculation demonstrating that any sediment accumulation placed the ultimate heat sink outside its analyzed condition for assuring the peak pond temperature limits could be met. The inspectors noted that engineering was aware that all three units were outside of their analyzed condition and chose to evaluate the condition before discussing the operability concern with operations personnel days later. The team noted that the failure of engineering to adequately communicate operability concerns with operations was also evident for the issue resulting in the Yellow finding. The inspectors reviewed the calculation performed by engineering. In assessing the situation, the licensee recognized that the sediment had a reduced ability to absorb heat. The team concluded that engineering lacked an effective questioning attitude and demonstrated poor technical rigor while evaluating this degraded condition since the accumulation of sediment had been known for years at the site and no evaluation to address the degraded condition had been performed until questioned by the NRC.

- During the review of licensee evaluations associated with maintaining inadequate essential spray pond chemistry controls, the inspectors identified that the licensee did not evaluate the most limiting conditions during a postulated design basis accident condition. Specifically, on June 22, 2006, the inspectors

discussed with chemistry personnel the effects of chemicals concentrating in the spray ponds during a design basis accident due to evaporative and spray losses. This concentration of chemicals could potentially have an adverse effect on the amount of scaling and precipitation and possibly reduce heat exchanger heat transfer capabilities. During the licensee's evaluation of this concern, they recognized that the existing analysis predicted that no scale would form in the heat exchangers cooled by the spray pond systems. This error resulted in the discovery that calcium phosphate fouling could occur during a design basis accident. The team noted that this issue was evaluated by engineering and determined to be a degraded but operable condition; however, operations personnel were not informed of this analysis even though it discussed potential compensatory measures that might be needed during accident conditions. Since personnel were not informed of this degraded condition, no formal OD was performed. The team determined that this example reflected an ineffective questioning attitude and demonstrated poor technical rigor by engineering. Additionally, the team noted this was another example involving the failure to inform operations personnel of degraded conditions affecting safety related systems.

As a result of ongoing NRC inspection activities, the NRC determined that the corrective actions taken to address the causal factors within Focus Area 3 were not completely effective. The team also noted that the licensee had made similar observations as follows:

- Operations management observed that, "Some events were still occurring although actions were in place to prevent occurrence." On April 25, 2006, CRDR 2887268 was initiated due to the recognition of ongoing performance deficiencies in the Operations Department with respect to QV&V, questioning attitude, technical rigor, human performance, and leadership. Various initiatives were identified, in addition to corrective actions specified in CRDR 2726509, that were either being developed or implemented when the team concluded the followup supplemental inspection.

- The Nuclear Assurance Department completed an interim effectiveness review as described in Condition Report Action Item (CRAI) 2825632 on July 27, 2006, to determine the effectiveness of corrective actions taken to address problems associated with questioning attitude and technical rigor. The review concluded that the actions taken to date have not been effective and that additional actions were necessary. The evaluator observed that the station had not anchored the culture of questioning attitude and technical rigor and that most of the actions completed to date have been either administrative in nature or a communication from management to improve in this area. The licensee initiated CRDRs 2913876 and 2913879 to engineering and operations for a re-evaluation of corrective actions.

- The Leadership Review Team initiated CRDR 2912678 on July 24, 2006, upon recognition that a number of areas of the Integrated Improvement Plan were not making the progress anticipated and some of the actions were not effective. The licensee identified several "high profile" issues that needed a more-focused effort

by the management team. Some of the "high profile" issues included: Inspection Procedure 95002 preparedness, CAP, OD process, procedural use and adherence, and human performance.

Similar to observations made by the supplemental inspection team on December 12, 2005, the licensee identified that CRAI 2825479, being implemented to correct deficiencies associated with Focus Area 3, was narrowly focused and not completely effective. This CRAI developed a plan to improve and anchor the organizational culture with respect to effective questioning attitude and technical rigor. The CRAI was designated as Priority 2, "Action to correct the root cause and prevent recurrence," and was completed on December 31, 2005. On May 31, 2006, the licensee determined that the initial closure for the CRAI was narrowly focused on engineering-related activities. The scope of the CRAI was expanded to include other primary organizations. The team noted that the action was further expanded on July 8, 2006, to develop and implement department specific plans until an overall site human performance program was developed and communicated to site personnel with appropriate metrics established to monitor performance. The team observed that the new site human performance program had not been issued at the conclusion of the followup inspection. Once the site plan has been developed in accordance with CRAI 2848143, and training for applicable site personnel completed in accordance with CRAI 2837178, the licensee plans to close this action and the department specific plans will no longer be applicable. Furthermore, CRAIs 2825633 and 2900264 (Sections 02.03.d.2 and .4) will remain open until the effectiveness of actions taken to address noted deficiencies in questioning attitude and technical rigor have been addressed.

An additional example of ineffective corrective actions to address deficiencies associated with Focus Area 3 was identified as a result of the team's observations. Specifically, CRAI 2825631 was initiated to develop a site-wide conservative decision-making model. This action was designated as Priority 3, "Actions to correct adverse conditions, apparent causes and contributing causes," and was completed on March 31, 2006. This action included the development of Guideline EDG-01, "Engineering Human Performance Tools," Revision 0, Guideline EDG-02, "Engineering Human Performance Tools for Technical Task Risk/Rigor," Revision 0, and the site-wide program under development in accordance with CRAI 2825479 as previously discussed. The team determined that implementation of this action has been ineffective as evidenced by the revised decision-making error (DME) metrics (Section 02.03.d.2). Upon review of the revised data, the licensee recognized that engineering was the largest contributor to a negative trend. Furthermore, analysis of the revised data identified that the human performance tools provided to engineering (i.e., EDG-01 and EDG-02) were not appropriately anchored within the organization. CRAI 2917371 was initiated on August 8, 2006, for engineering management to reinforce expectations for use of the engineering human performance tools.

.3 Evaluation Conclusions

The corrective actions taken in response to the root causes and related programmatic concerns involving Focus Area 3 (questioning attitude, technical rigor, and technical review) have not been completely effective. Specifically, following implementation of corrective actions between September 2005 and March 2006, the licensee: (1)

continued to conduct inadequate technical reviews of emerging issues; (2) did not routinely question the validity of engineering assumptions used to support operability decisions; (3) did not consistently implement a QV&V process; and (4) did not consistently notify operations personnel of immediate operability concerns. Consequently, this aspect of the Yellow finding will remain open pending additional review of the effectiveness of the licensee's corrective actions.

b. Prioritization of Corrective Actions with Consideration of the Risk Significance and Regulatory Compliance

The corrective actions were prioritized with consideration of the risk significance and regulatory compliance in that those corrective actions necessary to reduce risk and restore compliance were completed. The corrective actions to prevent recurrence were all categorized as Priority 2 commitments.

The initial supplemental inspection team observed that it did not appear that the licensee considered effectiveness reviews to be a part of the corrective action process. The team noted these reviews were not assigned, or maintained at, a priority commensurate with the issue (Inspection Report 05000528; 05000529; and 05000530/2005012). The followup supplemental inspection team observed that the licensee adequately addressed the concerns by reprioritizing the effectiveness reviews from Priority 4 to Priority 2 commitments and altering scheduled completion dates. This area was considered closed.

c. Establishment of a Schedule for Implementing and Completing the Corrective Actions

The licensee established a schedule for implementing and completing the corrective actions. This area was considered closed.

d. Establishment of Quantitative or Qualitative Measures of Success for Determining Effectiveness of Corrective Actions to Prevent Recurrence

.1 <u>Overall Metric Development</u>

The team determined that deficiencies existed in the metrics being used to measure the effectiveness of corrective actions for the Yellow finding. As a result of the team's observations, the licensee initiated CRDR 2913683 to determine why the focus area metrics have not met management's expectations. On August 7, 2006, the licensee completed a review of all focus area metrics against the "Metric and Performance Action Plan Guidelines," Appendix A, Revision 0, dated June 28, 2006. The licensee determined that the development of the focus area metrics did not use a consistent/standardized guidance document because the metric guideline document was not issued when the metrics were initially developed. Consequently, the focus area metrics did not contain the attributes required by the metric guideline document. Based on the review, CRAI 2913696 was generated on August 7, 2006, to adjust the metrics as necessary to ensure compliance with the Metric and Performance Action Plan Guidelines. The licensee completed a followup review by the end of August 2006, to verify the appropriateness of the revised effectiveness measures. The review identified concerns with metrics in each of the focus areas, including, in part, no metrics for the

quality of procedures, no leading indicators, and the need for automation of data. The licensee acknowledged that the metrics used to assess the effectiveness of corrective actions associated with the Yellow finding were recently developed and that it would take time to identify deficiencies and adjust the metrics to provide the feedback required to ensure continued improvement.

The team observed that several measures of effectiveness for corrective actions associated with the Yellow finding used department or site metrics. The team determined that there was no requirement to ensure that, upon indication of declining performance as trended by a department or site metric, the focus area owner would be notified for possible review of the effectiveness of corrective actions associated with the Yellow finding. The licensee initiated CRDR 2905100 on June 21, 2006, to evaluate this vulnerability. The licensee's review of the concern determined that existing procedural requirements ensured that the focus area owner would be informed of declining performance.

The licensee performed a trend review on August 3, 2006, for the period including January 1 through July 31, 2006, to evaluate the adequacy of all performance and health indicators used at Palo Verde. A subset of these performance and health indicators included metrics being used to measure the effectiveness of corrective actions for the Yellow finding. The trend review searched the CRDR database to identify when a performance/health metric indicated a degrading trend. The trend review identified a sharp increase in July 2006 in the number of CRDRs initiated to correct a degrading trend as noted by the associated performance/health metric. Between January through June 2006, there were no CRDRs written to develop action plans for a degrading metric. Forty CRDRs were initiated in July 2006 following the issuance of the Metric and Performance Action Plan Guidelines, which contained the formalization of when a CRDR was required to be initiated. Prior to the formal guidance, it was senior management's expectation that a CRDR be initiated for a Red metric or a metric that was Yellow for 2 consecutive months.

The team reviewed Procedure 60DP-0QQ02, "Trend Analysis and Coding," utilized by the licensee to provide guidance for identification of adverse trends. This guidance discussed the use of an upper control limit, that if exceeded, would require the licensee to perform an evaluation of the increase in the number of occurrences or errors identified in a given trended category. The procedure stated that the upper control limit should be based on either a statistical method or a management set value. The statistical method was based on a mathematical relationship to the occurrences over a given time period (usually 18 months). The limit would be calculated based on a number of standard deviations above the mean. The team noted that a significant number of trended categories utilized the statistical method instead of a management set value. In review of the statistical method, the team noted that declining performance would not be captured on all occasions by use of the statistical upper control limit since the limit would tend to follow the trend and not provide for detection of potential adverse trends unless there was a significant change over a short time. Additionally, use of the upper control limit would not ensure challenging goals were set to promote continuous improvement. The licensee acknowledged these observations and stated they would assess the method by which upper control limits were established.

.2 Inadequate Human Performance Indicator

In June 2006, the licensee implemented a human performance indicator in accordance with CRAI 2825633 to identify and trend decision-making errors(DMEs). The DME metric subcategories included: (1) Questioning Attitude; (2) Technical Rigor; (3) Failure to Recognize Hazard-Error-Deficiency; (4) Non-Conservative Decision-Making; and (5) Proceeding in the Face of Uncertainty. The CRAI also required a trend review to measure the effectiveness of corrective actions and directed the following if the results of the review were unsatisfactory: "Initiate a CRDR in accordance with Procedure 90DP-0IP10, "Condition Reporting," Revision 27, Step 3.9.9.3. The CRDR shall be initiated to document the ineffective corrective action(s), determine why the previous action(s) were ineffective in correcting the condition, and implement new actions to correct the condition. The CRDR should also determine with Nuclear Regulatory Affairs if the Notice of Violation and licensee event report (LER) responses to the ECCS configuration violation need to be revised and/or NRC contacted."

The licensee initially back-coded the human performance indicator to July 2005 to evaluate the effectiveness of corrective actions taken to correct deficiencies associated with Focus Area 3. The licensee completed a trend review of the DME metric in accordance with CRAI 2825633 for the period between July 2005 through May 2006 and concluded that, "Actual trends for questioning attitude and technical rigor are improving for this period," and "The DME trend overall is improving." The evaluator concluded that no CRDR was required by Procedure 90DP-0IP10.

While reviewing the trends associated with Focus Area 3, the team observed that the licensee failed to include in the DME metric those examples identified in CRDRs classified as Adverse conditions. The team noted that Adverse CRDRs documented numerous performance deficiencies that should have been corrected by actions identified for the root and contributing causes for the Yellow finding. The team determined that the DME metric was inadequate since the licensee did not include Adverse CRDRs in the data set. On July 26, 2006, the licensee initiated CRDR 2913443 to evaluate the condition and developed the following actions:

- Review control room logs each normal work day (rolled up weekly) to determine if concerns lead to an issue of "Questioning Attitude/Technical Rigor." In each case identified, it will be verified that a CRDR was written (CRAI 2917125);

- Work orders will be reviewed each normal work day (rolled up twice a month) to determine if work orders have been properly classified by operations as "Degraded/Non-Conformance." If nonconservatively classified, verify a CRDR was initiated (CRAI 2917128);

- Change the process criteria to require that all Adverse, Apparent Cause, and Significant CRDRs be coded for this area;

- Back-code all CRDRs retroactive to January 2006 using current DME codes; and

- Rebaseline trends, adjust goals, and metric thresholds as appropriate.

Following back-coding and rebaselining of the DME metric using Adverse CRDRs, a notable trend increase was identified. Specifically, the new trend ramped up from 61 occurrences per month in January 2006 to 138 occurrences per month in June 2006. Prior occurrences using the inadequate DME metric were in the 1 to 5 range for the same time. The DME metric window was designated red (Significant Weakness) in June 2006 and yellow (Improvement Needed) in July 2006 by management discretion. Consequently, CRDR 2916511 was written to further analyze and evaluate the revised DME metric to determine whether the trend provides a valid indication of corrective action effectiveness. The licensee planned to complete an effectiveness review (CRAI 2917129) by November 30, 2006, to determine if additional corrective actions are warranted.

.3 Operabilty Determination Indicator

As previously discussed in Section 02.03.a.2, the team noted that a number of recent performance deficiencies, reflective of the licensee's current performance, pertained to human performance errors that impeded effective implementation of the OD process. The team noted that the licensee was performing effectiveness reviews of engineering product quality using an OD category as a trending input (Section 02.03.d.4).

The team reviewed the OD trend for June 2006 and noted that the licensee had identified six occurrences of ODs that displayed performance problems, two of which were the direct result of NRC involvement. Additionally, the team noted that a significant number of OD performance deficiencies were not accounted for in the trend analysis. At least four other NRC identified OD performance deficiencies that occurred in May and June 2006 were not placed into the OD metric even though the issues were contained in the licencee's CAP. Additionally, one OD event that was placed into the metric pertained to multiple examples of inadequate ODs, yet it only counted as one data point in the metric. The licensee acknowledged that these examples should have counted as multiple occurrences for the trend. Overall, the team determined that use of this trend to assess the effectiveness of corrective actions for the Yellow finding was questionable based on the number of examples that were the result of NRC involvement and the number of examples that failed to be adequately evaluated and placed into the OD trend. In response to the team's observations, the licensee developed a new OD metric to comply with the Metric and Performance Action Plan Guidelines.

.4 Effectiveness Reviews

Interim Monitoring

CRAI 2853888 was initiated as a Priority 2 action to perform an integrated assessment of the human performance aspects of Focus Area 3, PI&R (Focus Area 5), and Industry OE (Focus Area 6). According to the long range assessment plan, the human performance and PI&R assessments were scheduled for 2006 and the OE assessment for 2007. The team noted that the CRAI stated that interim monitoring would be achieved by the Metric and Performance Action Plan Guideline. In accordance with the guideline, monthly performance monitoring metrics, including metrics for PI&R, human performance, and OE are reviewed by management and, if targets are not met, an action plan is required to be developed to improve performance. The team observed

that the interim monitoring would not work unless the metrics adequately measured effectiveness and action plans were developed when a declining trend was noted. As a result of the team's observations documented in Sections 02.03.a.2, 02.03.b.1, .2, and .3, the team did not have assurance that the interim monitoring associated with CRAI 2853888 would adequately measure corrective action effectiveness.

Interim Effectiveness Review for Engineering Product Quality

CRAI 2900264 was initiated to perform effectiveness reviews to monitor the improvement of engineering products. The CRAI stated that improvements in engineering product quality, as well as station product quality, will be assessed using the site trending tool. The site trending tool includes CRDRs generated by the Engineering Products Review Board, the Design Review Board, Nuclear Assurance Department evaluation reports, and conduct of departmental assessments. The CRAI further specified that the categories that pertain to engineering product quality in the site trending tool included: (1) Engineering Product Quality; (2) Operability Determinations; (3) Design/Licensing Bases; and (4) Decision Making Errors (Engineering).

In accordance with CRAI 2900264 and Procedure 60DP-0QQ02, "Trend Analysis and Coding," Revision 13, the licensee performed an interim effectiveness review concerning Engineering Product Quality. The four site trending tool categories were reviewed for the period ending May 2006. The review noted that (1) engineering product quality as measured from the Engineering Product Review Board, was improving; (2) OD issues were increasing (worsening performance) slightly; (3) the number of Design/Licensing Bases CRDRs were declining (improving performance) overall; and (4) questioning attitude and technical rigor in Engineering, as measured under the DME category and sub-categories were improving over the period of July 2005 through May 2006. This review resulted in the following conclusions, "Overall Engineering performance with respect to the engineering product quality corrective action effectiveness appears to be mixed. It appears to be too early to determine if the trends are improving or worsening with respect to the RAS (Yellow finding) investigation (CRDR 2726509) and if corrective actions were effective. This effectiveness review needs to be continued monthly as previously planned and as dictated by the CRAI. No new Trend CRDRs will be initiated for the above."

As a result of the observations described in Sections 02.03.d.2 and .3, the team determined that the conclusions associated with the interim effectiveness review for engineering product quality were based on suspect data and did not accurately reflect the effectiveness of corrective actions. Following NRC observations, the licensee re-evaluated the trend and generated CRDR 2916511, which resulted in CRAI 2917371 to take additional actions to improve engineering human performance and product quality (Section 02.03.a.2).

.5 Evaluation Conclusions

The team concluded that adequate qualitative or quantitative measures for determining the effectiveness of the corrective actions to prevent recurrence have not been established. For example, not all relevant performance data was considered when performance monitoring measures were developed to assess the effectiveness of

corrective actions. When the pertinent data was considered, or otherwise clarified, the performance measures suggested declining rather than improving performance within these areas. Consequently, the team determined that the Yellow finding would remain open pending the development and effective implementation of measures and metrics to monitor the corrective actions associated with the Yellow design control finding.

The team concluded that the licensee had not completed adequate reviews of the effectiveness of corrective actions prior to their notifying the NRC of their readiness for closure of the Yellow finding. Specifically, several assessments were completed after the requested dated of the inspection (June 2006). Several of the assessments noted that insufficient progress in resolving some of the root and contributing causes had been made. Additionally, a standard guideline for metrics was not issued and implemented until July 2006.

03 OTHER ACTIVITIES

Event Follow-up (71153)

(Closed) LER 05000529; 05000530/2005-005-00, "TS Required Reactor Shutdown - LCO 3.0.3 A Inoperable ECCS, Containment Spray & Refueling Water Tank"

On October 11, 2005, the licensee shutdown Units 2 and 3 after declaring both units' trains of the ECCS and the CS system inoperable. The licensee had determined that the design analyses for these systems had not adequately addressed the possibility of ingesting air into the ECCS and CS pumps during the drawdown period following a recirculation actuation signal. An analysis was subsequently performed that demonstrated that the ECCS and CS systems had been operable. This issue was reviewed during the December 2005 supplemental inspection and was determined to involve an NCV. The issue is documented in Section 4OA5.1 of NRC Supplemental Inspection Report 05000528; 05000529; and 05000530/2005012 as NCV 05000528; 05000529; 05000530/2005012-01, "Improper Design Control for ECCS Sump and RWT Swapover." This LER is closed.

04 MANAGEMENT MEETINGS

Exit Meeting Summary

On September 1, 2006, the team presented the results of the followup supplemental inspection, conducted under Inspection Procedure 95002, to Mr. J. Levine, Executive Vice President of Generation, and other members of his staff. The licensee acknowledged the findings presented. The inspectors noted that while proprietary information was reviewed, none would be included in this report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

T. Albrigo, Advocate to Corrective Action Program, Nuclear Engineering
J. Allison, Section Leader, Performance Improvement
G. Andrews, Department Leader, System Engineering
S. Bauer, Department Leader, Regulatory Affairs
B. Bolf, Engineer, System Engineering
P. Borchert, Director, Operations
R. Bouquot, Section Leader, Nuclear Assurance Division
M. Brutcher, Section Leader, Design Engineering
D. Carnes, Director, Nuclear Assurance
W. Chapin, Director, Performance Improvement
C. Churchman, Director, Engineering
E. Dutton, Section Leader, Performance Improvement
C. Eubanks, Vice President, Operations
J. Gaffney, Director, Radiation Protection
T. Gray, Radiological Services Department Leader, Radiation Protection
N. Henry, Senior Team Member, Performance Improvement
J. Hesser, Director, Emergency Services
M. Karbassian, Department Leader, Design Engineering
D. Leech, Department Leader, Performance Improvement
J. Levine, Executive Vice President, Generation
D. Mauldin, Vice President, Engineering
M. McGhee, Unit Department Leader, Operations
G. Michael, Consulting Engineer, Licensing
M. Radspinner, Section Leader, Systems Engineering
F. Riedel, Director, Nuclear Training
J. Scott, Section Leader, Nuclear Assurance
C. Seaman, General Manager, Regulatory Affairs and Performance Improvement
M. Shea, Director, Maintenance
E. Sonn, Lead Investigator, Performance Improvement
M. Sontag, Department Leader, Performance Improvement
D. Straka, Senior Consultant, Regulatory Affairs
D. Vogt, Lead STA, Operations
T. Weber, Section Leader, Regulatory Affairs
D. Wheeler, Section Leader, Performance Improvement

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened/Closed

05000528; 05000529; 05000530/2006010-01	FIN	Summary Finding. 95002 Team's Assessment of IR 2004-14 (Yellow) 10 CFR Part 50, Appendix B, Criterion III, Violation (Section 02.03)

Closed

05000529; 05000530/2005005-00	LER	TS Required Reactor Shutdown - LCO 3.0.3 A Inoperable ECCS, Containment Spray & Refueling Water Tank (Section 03)

Discussed

05000528; 05000529; 05000530/2004014-01	VIO	Failure to Maintain Design Control of Containment Sump Recirculation Piping (Section 01)

LIST OF DOCUMENTS REVIEWED

In addition to the documents called out in the inspection report, the following documents were selected and reviewed by the inspectors to accomplish the objectives and scope of the inspection and to support any findings:

CRDRs

2521395	2825473	2897190	2905465	2909654	2912182
2726509	2825474	2897266	2905762	2909657	2912448
2729600	2825657	2897471	2906099	2909658	2912539
2759422	2833459	2897810	2906487	2909659	2912575
2785329	2833743	2898237	2906671	2909660	2913018
2785331	2835132	2899634	2906818	2909661	2913078
2785335	2838626	2901186	2906937	2909664	2913361
2785337	2841872	2901432	2906947	2909666	2913443
2806832	2853249	2901815	2906974	2909689	2913447
2820126	2853780	2902140	2908244	2909759	2913768
2822343	2853784	2902565	2908399	2909943	2913790
2822429	2859409	2902625	2908484	2910934	2913856
2824066	2882166	2903580	2908604	2911761	2914106
2825460	2885480	2904117	2908620	2911761	2914134
2825464	2888429	2904119	2909619	2912008	2916511
2825472	2890993	2905162	2909653	2912100	

CRAIs

2759419	2785413	2825483	2825654	2830094	2856545
2759445	2785415	2825484	2825654	2833459	2856565
2785286	2785418	2825630	2825657	2837074	2856973
2785293	2785420	2825630	2825659	2837082	2857505
2785301	2808185	2825632	2825660	2837341	2867278
2785321	2813598	2825633	2825663	2845862	2874281
2785329	2823531	2825633	2825665	2853780	2878457
2785348	2825286	2825634	2825667	2853784	2886008
2785351	2825321	2825637	2825667	2853888	2893281
2785352	2825348	2825639	2825668	2853896	2893284
2785362	2825350	2825640	2825669	2856425	2894687
2785362	2825475	2825641	2825676	2856499	2894689
2785378	2825478	2825642	2825677	2856503	2894710
2785390	2825480	2825645	2825678	2856508	2895670
2785396	2825481	2825645	2825679	2856531	2900264
2785397	2825482	2825646	2828875	2856533	2917364
2785409	2825482	2825650	2830094	2856541	2917369
2785412	2825483	2825652			

Procedures

NUMBER	TITLE	REVISION
65DP-0QQ01	Industry Operating Experience Review	9
93DP-0LC05	Regulatory Interaction and Correspondence Control	10
PG-120	PVNGS Self Assessment And Benchmarking	6
60DP-0QQ19	Internal Audits	14
EDG-01	Engineering Human Performance Tools	0
EDG-02	Engineering Human Performance Tools for Technical Task Risk/Rigor	0
73TD-0ZZ03	System Engineering Handbook	4
90DP-0IP10	Condition Reporting	29
40DP-9OP26	Operability Determinations	17
60DP-0QQ02	Trend Analysis and Coding	12
ODP-16	Operations Department Practices	5

Miscellaneous

NUMBER	TITLE	DATE
NAD Audit Plan 2006-004	Chemistry	02/05/06
NAD Audit Plan 2006-006	Operations/Refueling	03/31/06
NGH36C000100	RAS Case Study	01/10/06
NVT06-C-0001-01	Control of Design and Licensing Basis	01/27/06
NGT94-C-0001-01	NGT94 Conduct of Engineering	02/24/06

TITLE	DATE
Operations Night Order	06/15/06
Operations Night Order	06/23/06
Unit 1 Operator Logs	04/01/06
Unit 1 Operator Logs	06/08/06
Unit 1 Operator Logs	06/10/06
Root Cause Investigation Manual for Significant CRDRs	05/06
Engineering Handbook	04/06
Condition Reporting Trend Report	06/06
Human Performance Program Health Report	06/06
Monthly Trend Report	06/06
Various Category Trend Reports	2006

TITLE	REVISION
Standards and Expectations Preventing Events	1
Leader Standards and Expectations	0
Metric and Performance Action Plan Guideline	0

TITLE
Performance Improvement Team Assessment Plan CRAI 2853896 and 2853888; Human Performance, Corrective Action, and Operating Experience
Low-Tier Operating Experience Distribution/Review Process

LIST OF ACRONYMS

ADAMS	agencywide documents and access management system
CAP	corrective action program
CFR	*Code of Federal Regulations*
CRAI	condition report action item
CRDR	condition report/disposition request
CS	containment spray
DME	decision making error
ECCS	emergency core cooling system
EDG	emergency diesel generator
LER	licensee event report
NCV	noncited violation
NRC	Nuclear Regulatory Commission
OE	operating experience
OD	operability determination
PI&R	problem identification and resolution
PVNGS	Palo Verde Nuclear Generating Station
QV&V	qualify, validate & verify
RAS	recirculation actuation signal
VIO	violation
UFSAR	Updated Final Safety Analysis Report