

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE

SALP BOARD REPORT

Nos. 50-528/528/530/93-19

ARIZONA PUBLIC SERVICE COMPANY

PALO VERDE NUCLEAR GENERATING STATION

MARCH 1, 1992 THROUGH MAY 31, 1993

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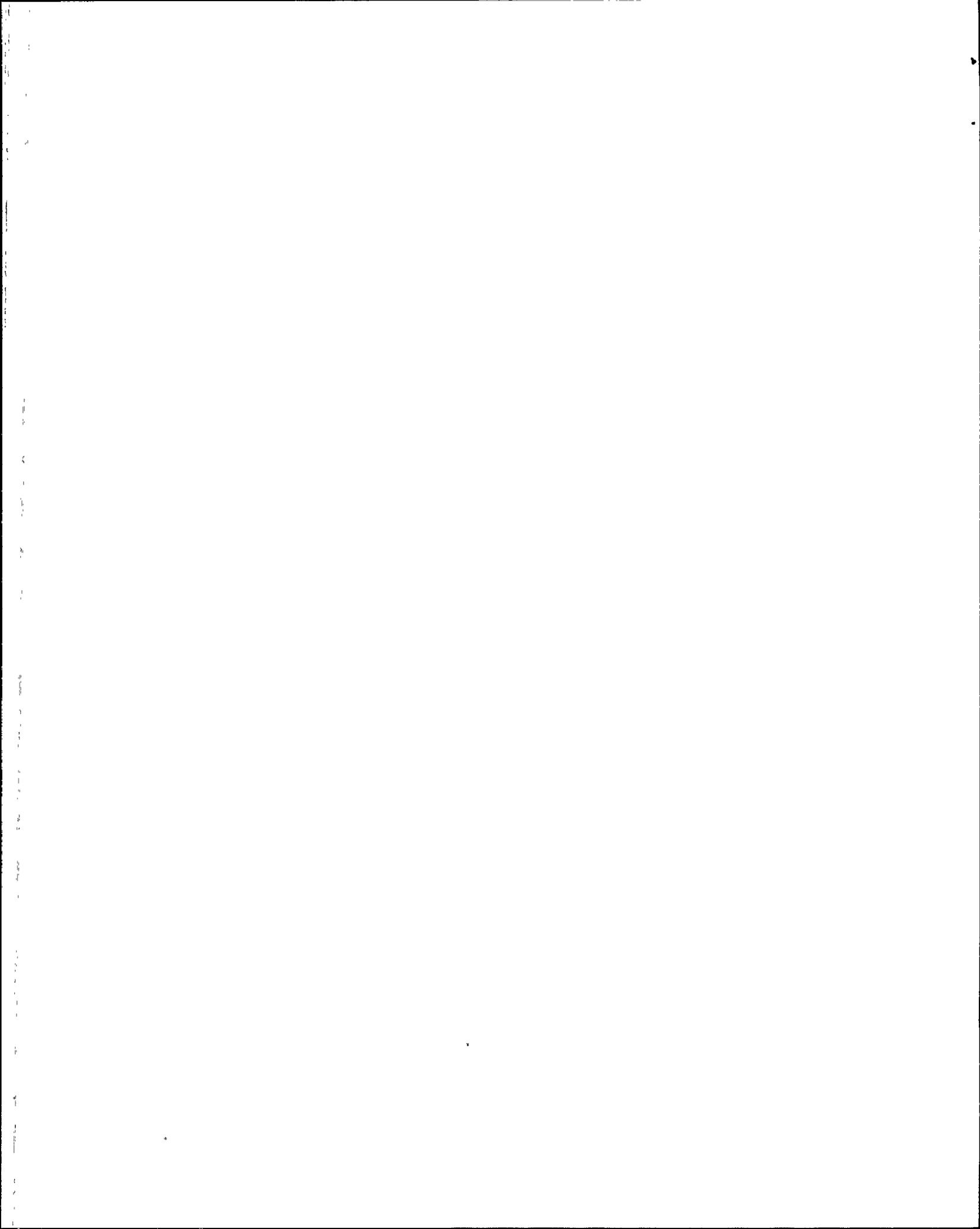
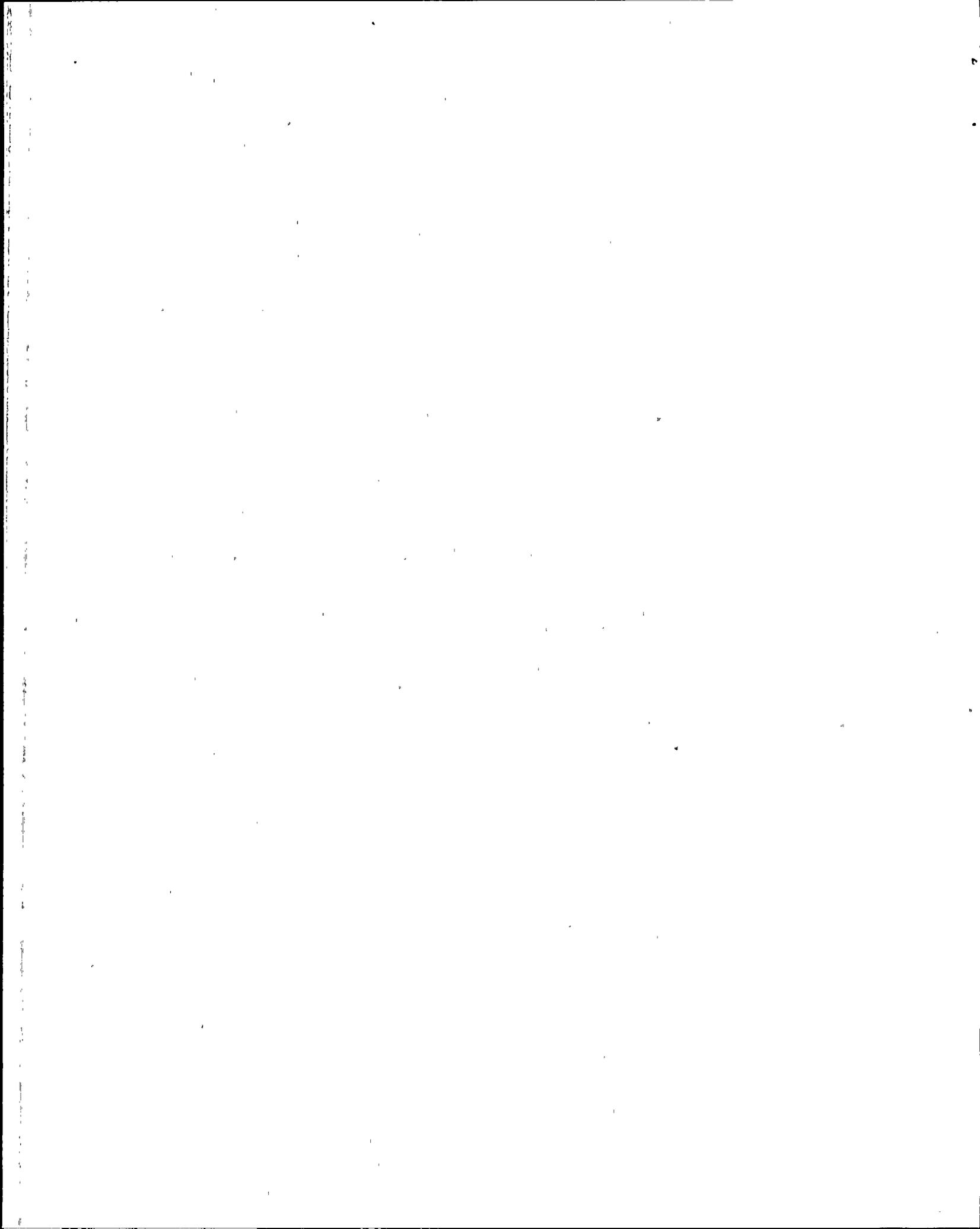


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I. INTRODUCTION

The Systematic Assessment of Licensee Performance (SALP) is an integrated NRC staff effort to collect available observations and data on a periodic basis and to evaluate licensee performance based on this information. The program is supplemental to normal regulatory processes used to ensure compliance with NRC rules and regulations. It is intended to be sufficiently diagnostic to provide a rational basis for allocating NRC resources and to provide meaningful feedback to licensee management regarding the NRC's assessment of their facility's performance in each functional area.

An NRC SALP Board, composed of the members listed below, met in the Region V office on June 22, 1993, to review observations and data on the licensee's performance in accordance with NRC Management Directive 8.6 (NRC Manual Chapter 0516, Systematic Assessment of Licensee Performance).

This report is the NRC's assessment of the licensee's safety performance at Palo Verde Nuclear Generating Station for the period March 1, 1992, through May 31, 1993.

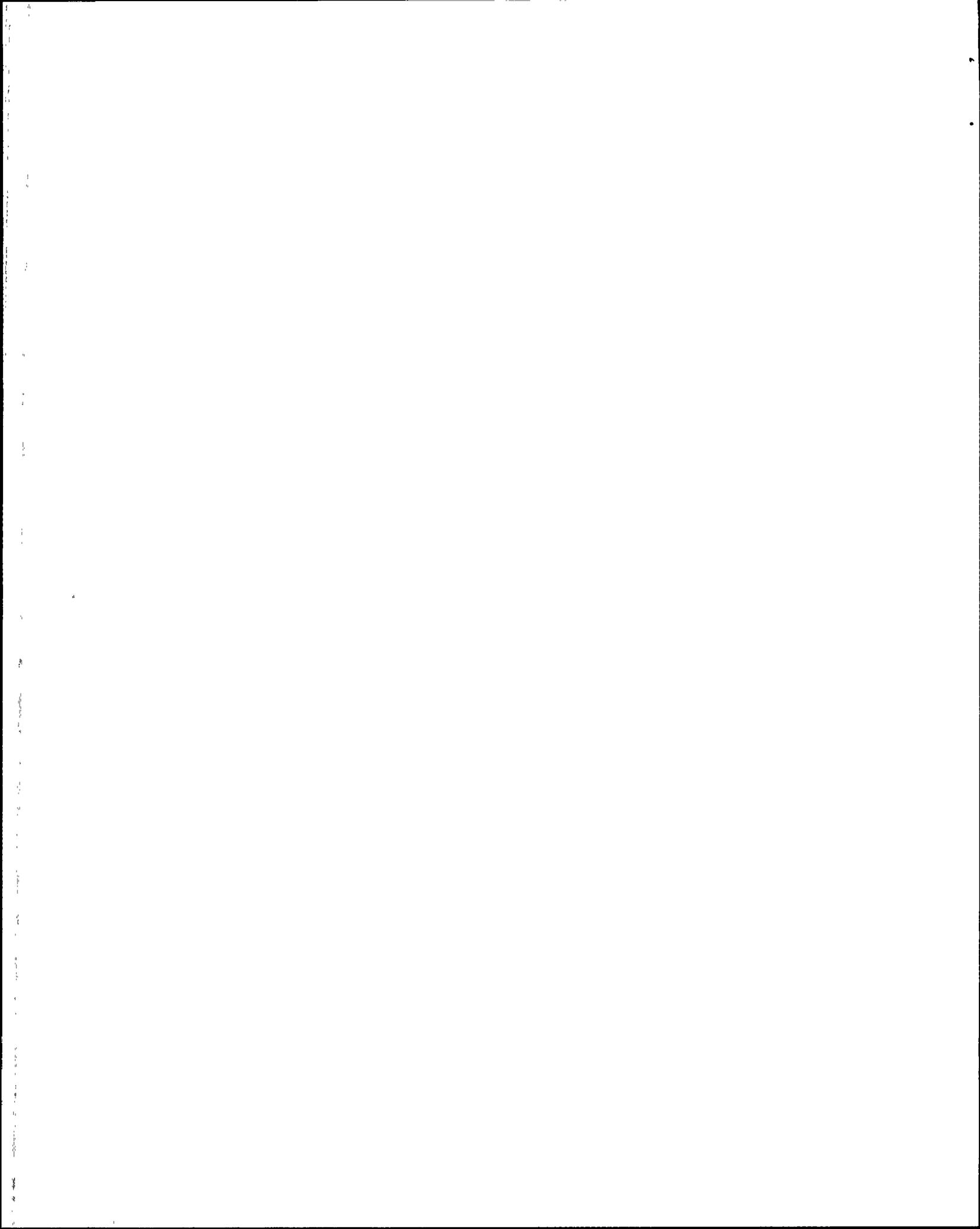
The SALP Board meeting for Palo Verde was attended by:

Voting Members

- K. Perkins, Director, Division of Reactor Safety and Projects, RV (SALP Board Chairman)
- T. Quay, Director, Project Directorate V, NRR
- F. Wenslawski, Deputy Director, Division of Radiation Safety and Safeguards, RV
- L. Miller, Chief, Reactor Safety Branch, RV
- H. Wong, Chief, Reactor Projects Section II, RV
- C. Trammell, Senior Project Manager, NRR
- J. Sloan, Senior Resident Inspector, Palo Verde

Other Attendees

- C. Serpan, Acting Deputy Director, Division of Reactor Safety and Projects, RV
- J. Reese, Chief, Facilities Radiological Protection Branch, RV
- R. Pate, Chief, Safeguards, Emergency Preparedness and Non-Power Reactor Branch, RV
- C. VanDenburgh, Chief, Reactor Projects Branch, RV
- D. Kirsch, Technical Assistant, RV
- W. Ang, Chief, Engineering Section, RV
- D. Acker, Reactor Inspector, RV
- D. Schaefer, Safeguards Inspector, RV
- P. Qualls, Emergency Preparedness Analyst, RV
- H. Freeman, Resident Inspector, RV
- L. Tran, Project Manager, NRR
- P. Ray, NRR
- B. Olson, Project Inspector, RV



II. SUMMARY OF RESULTS

A. Overview

Licensee performance in the functional area of Engineering/Technical Support was considered to be good and to have improved from the previous assessment period, resulting in a rating of Category 2, Improving. Attributes which contributed to improvement in this functional area included the strong management support for engineering programs and a strong engineering staff.

After considerable discussion, performance in the functional area of Plant Operations was rated as Category 2. Operator performance in this area appeared to have improved; however, in light of deficiencies in the requalification program, the Board could not conclude that an improving trend was justified overall for this functional area. The Board also observed that while command and control has generally improved, some operating crews still exhibited weaknesses in command and control.

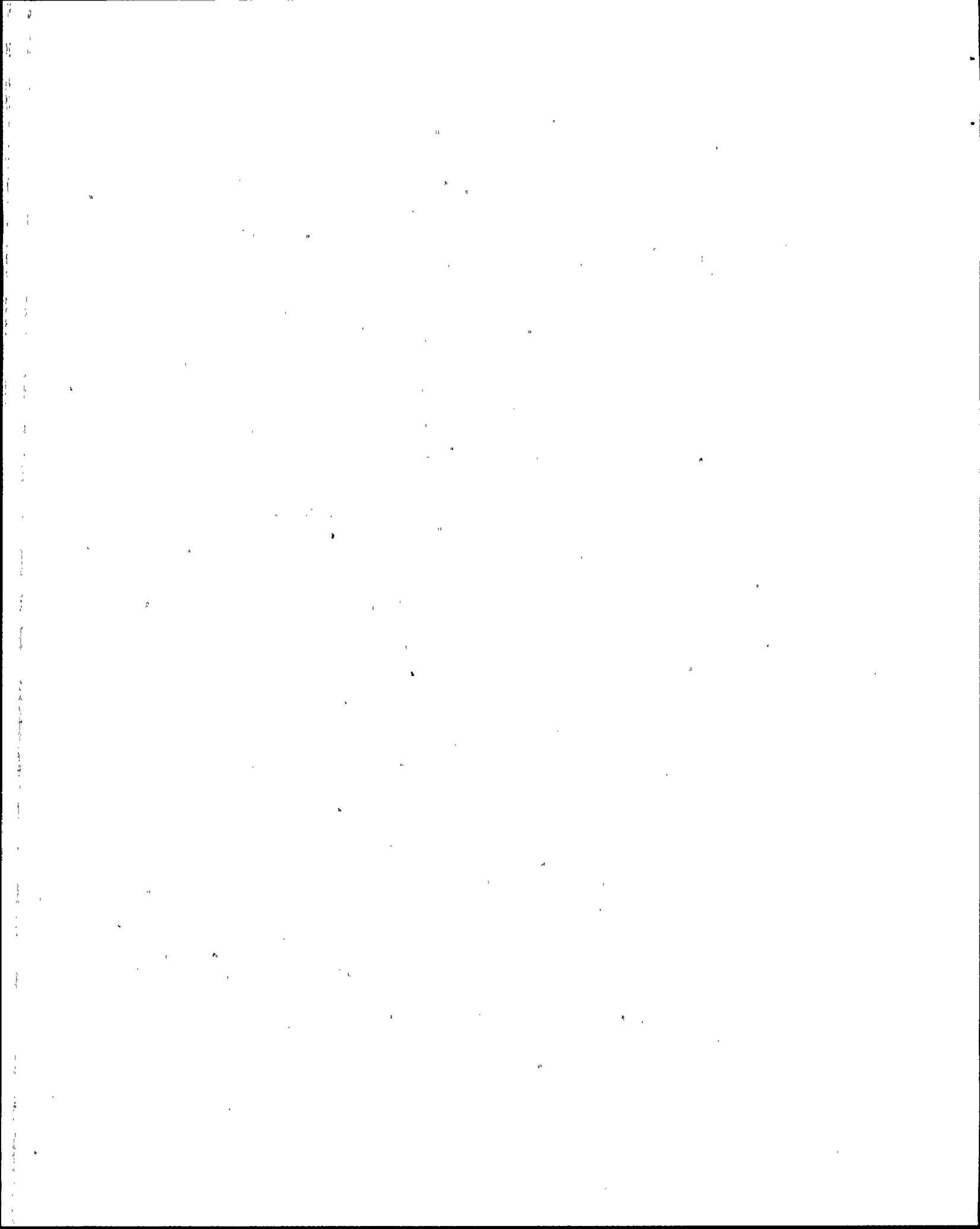
Performance in the functional area of Maintenance/Surveillance was rated as Category 2 and reflects an NRC concern about worker performance issues, procedural quality, and procedural adherence. The Board recognized that the licensee has recently put into place mechanisms and measures to address these concerns, and future performance will depend on the ability of APS management to assure these initiatives are effective.

Although some improvement was observed in the functional area of Safety Assessment/Quality Verification, the Board determined that performance was still rated as Category 2. The Board discussed the need for licensee management to fully communicate their expectations to all levels of the organization and to foster an environment where all employees feel free to raise issues.

Licensee performance in the functional area of Security continued to be rated as Category 2. Although the Board observed that upgrades have been made to security hardware systems, the strained relations between security officers and management hampers improvement in performance.

A declining trend in performance was observed in Emergency Preparedness, although the functional area was still rated as Category 1. While the Emergency Preparedness organization appeared to remain strong, weaknesses observed during a March 1993 steam generator tube rupture event raised questions regarding the continued superior level of performance that had been previously observed in this area.

The licensee's performance in the area of Radiation Protection declined from a previous Category 1 rating to a Category 2 rating during this assessment period. This decline was characterized by a lack of attention to detail and procedural adherence in day-to-day radiation protection activities, including high radiation area controls, control of radioactive material, and control of radwaste activities. Additional management attention is warranted in these areas.



B. Results of Board Assessment

Overall, the SALP Board found the performance of NRC licensed activities to be effective and directed toward safe operation of Palo Verde. The SALP Board has made specific recommendations in all functional areas for licensee management consideration. The results of the Board's assessment of the licensee's performance in each functional area, along with the results from the previous period, are as follows:

<u>Functional Area</u>	<u>Rating Last Period</u>	<u>Trend</u>	<u>Rating This Period</u>	<u>Trend</u>
A. Plant Operations	2		2	
B. Radiological Controls	1		2	
C. Maintenance/Surveillance	2		2	
D. Emergency Preparedness	1		1	Declining
E. Security	2		2	
F. Engineering/Technical Support	2		2	Improving
G. Safety Assessment/ Quality Verification	2		2	

III. PERFORMANCE ANALYSIS

The following is the Board's assessment of the licensee's performance in each of the functional areas, along with the Board's conclusion for each area and its recommendations with respect to licensee actions and management emphasis.

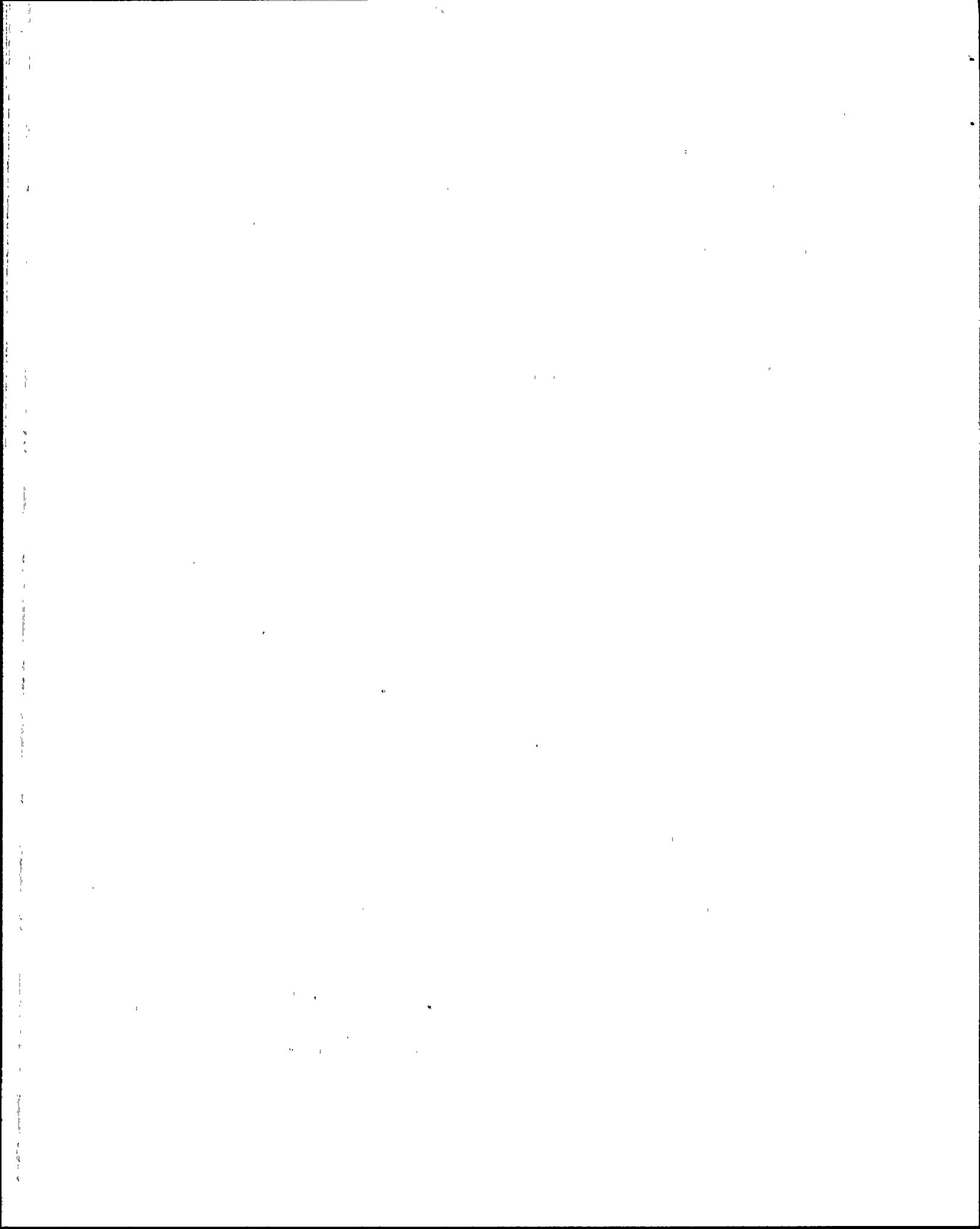
A. Plant Operations

1. Analysis

During the assessment period, the licensee's plant operations were observed routinely by both the resident and the regional staff. The NRC devoted approximately 35 percent of the total inspection effort to this functional area.

The licensee's performance was rated as Category 2 during the previous assessment period. Strengths included operator response to events, control of operational activities, and an onsite fire department. Weaknesses included numerous instances of failure to follow procedures, command and control deficiencies, and communications deficiencies.

During this assessment period overall performance in the operations area improved. Operator response to events was generally a strength, and command, control, and communications were notably improved in some operating crews. Management was fairly effective in promulgating expectations, resulting in improved procedural adherence. Weaknesses were noted in the emergency operating



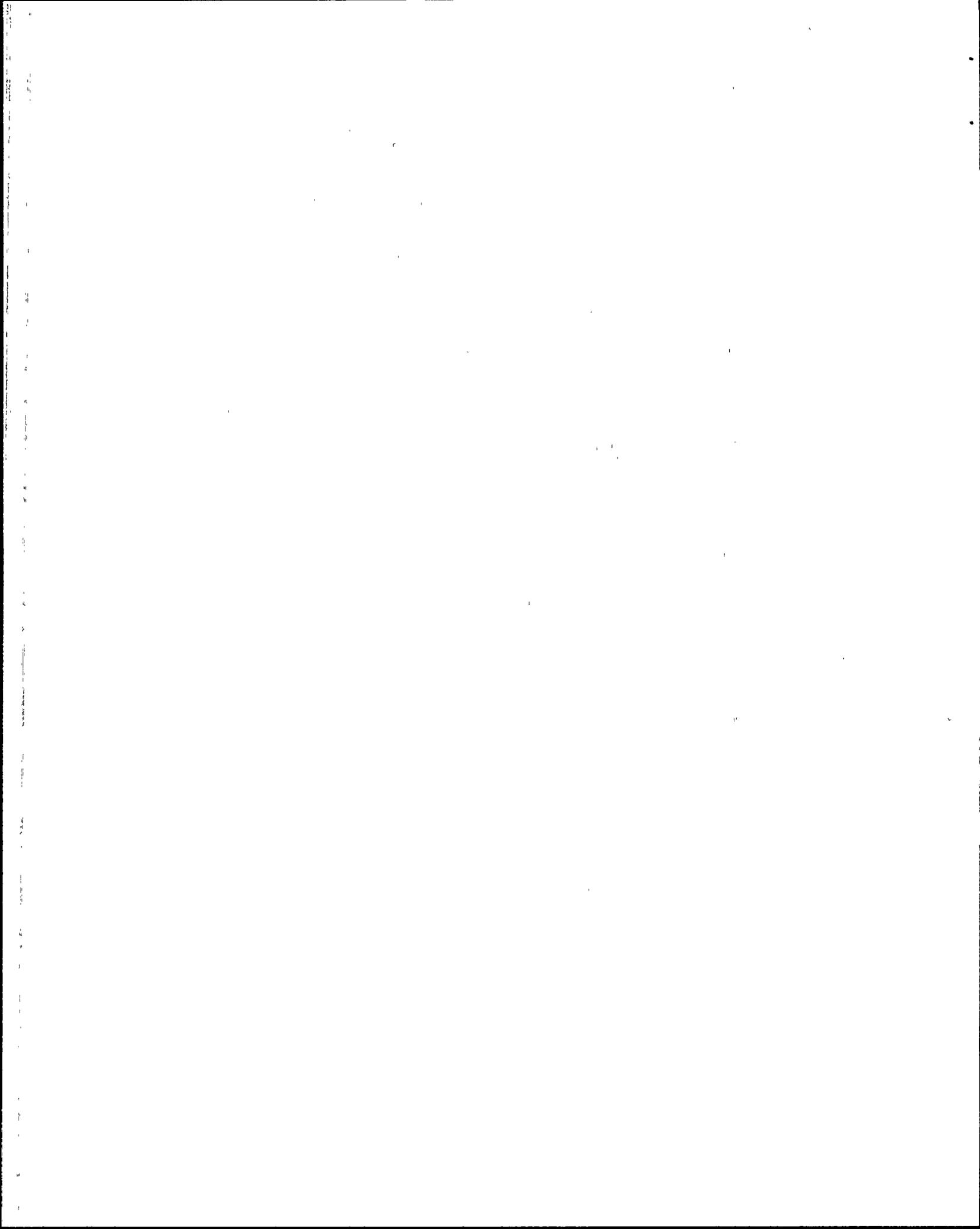
procedures (EOPs), resolution of technical issues, operator performance of job performance measures (JPMs), and implementation of the roving fire watch program by security officers.

Operator performance during events continued to be a strength overall. Operator response was characterized, particularly in some crews, by positive command and control and by good communications. Operators generally took appropriate actions as required by the events. During the Unit 2 steam generator tube rupture (SGTR), operators took actions which limited the consequences of the event such as securing the correct reactor coolant pumps and placing the steam bypass control system in manual control. During the Unit 3 loss of plant annunciator and alarm systems, good use of command, control, and communications was effective in avoiding challenges to plant safety systems. While the command, control, and communications areas have significantly improved over the previous assessment, in one instance operators failed to respond promptly to confirm field reports which resulted in nearly overfilling the refueling cavity in Unit 3.

Several weaknesses, principally involving the use and adequacy of emergency operating procedures, were noted during the SGTR event; specifically: (1) training and use of the EOPs, along with flaws in the diagnostic logic trees, delayed event identification and entry into the appropriate recovery procedure, (2) operators took three hours to isolate the steam generator, (3) the shift supervisor failed to follow the event classification procedure, (4) the EOP bases of using alarm setpoints were not effective for event classification, and (5) deficiencies in simulator response reinforced negative training.

In general, the licensee's approach to technical issues was sound. The operator's response to unacceptable reactor protection system surveillance testing results was appropriate. The licensee revised the Mode 6 operating procedure in response to concerns in the previous SALP period, and similar problems have not recurred. Additionally, management attention substantially reduced the number of operator errors during refueling outages. A few weaknesses were observed such as not declaring a feedwater isolation valve inoperable when several attempts to move the valve failed, and a spill of thousands of gallons of slightly contaminated water from the condensate system following the SGTR event. Additionally, failure to correct a known deficiency in a startup breaker disconnect switch resulted in a reactor trip and several feedwater system water hammers in Unit 2.

Despite marginal performance during the NRC's requalification evaluation, the training program improved during the assessment period. Simulator capabilities were substantially improved although the NRC identified some fidelity problems. Operator performance expectations were raised, and cooperation between the operations and training departments improved. Although the



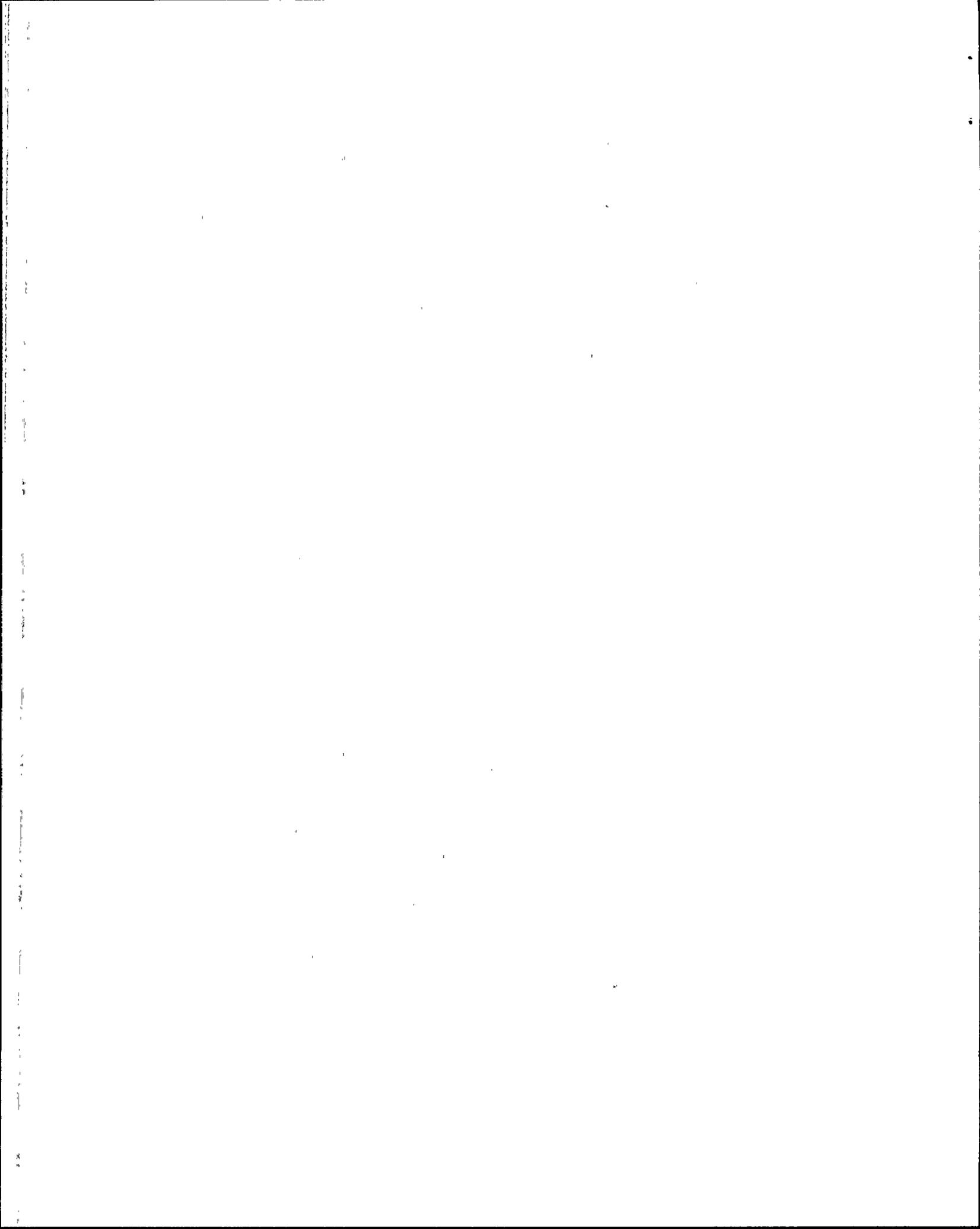
training program passed the requalification evaluation, operator performance during drills in the simulator showed some decline since the previous evaluation. Noted deficiencies included the inability to control reactor coolant system parameters by controlling secondary system components, a lack of knowledge of electrical power supplies, and a lack of interaction between some shift supervisors and control room supervisors. Additionally, several operators failed one or more JPMs. Finally, some operators required excessive time to use the EOPs to diagnose and mitigate simulated transients.

While procedural adherence improved and violations of less safety significance were issued in the operations area than in the previous SALP period, several plant events were attributed to personnel errors. Personnel failed to follow an alarm response procedure which resulted in flooding of the auxiliary building. An operator failed to verify the plant status before authorizing work as required by procedures which resulted in a refueling cavity spill. Reactor trips were caused by an improper secondary valve lineup and by securing the wrong motor generator set.

Some of the improvement in procedural adherence was due to increased management attention. Management effectively communicated its performance expectations through the "Sensitive Issues Manual." Additionally, management increased its observations of routine and complex evolutions, including pre-evolution briefings, operator log taking, and shift turnovers. Management has taken these actions in response to noted deficiencies.

Due to an NRC inspection, the licensee determined that the EOPs required more than the license minimum staffing of two auxiliary operators (AOs). Therefore, the licensee committed to maintain a minimum of four AOs per shift. Other staffing changes included an increase in the number of operators to support a six crew rotation, and licensee commitments to maintain one shift technical advisor per unit while in Modes 1 through 4. In addition, the licensee is reviewing the role of the shift technical advisor after the steam generator tube rupture event. Management positions within the operations departments have remained fairly stable during the assessment period.

The licensee's onsite fire department continues to be a strength of the fire protection program. Weaknesses were noted in the implementation of a program to use security officers as roving fire watches. The officers believed that this program was implemented prior to their having a clear understanding of their duties and watch requirements. Additionally, the program initially did not have a contingency plan to cover fire tour requirements when the officer had to respond to security alarms.



2. Performance Rating

Performance Assessment - Category 2

3. Recommendations

Management should continue to emphasize adherence to procedures and effective command, control, and communications. Management should ensure the consistent improvement in the EOP training program and operator familiarity with the proper use of the EOPs.

B. Radiological Controls

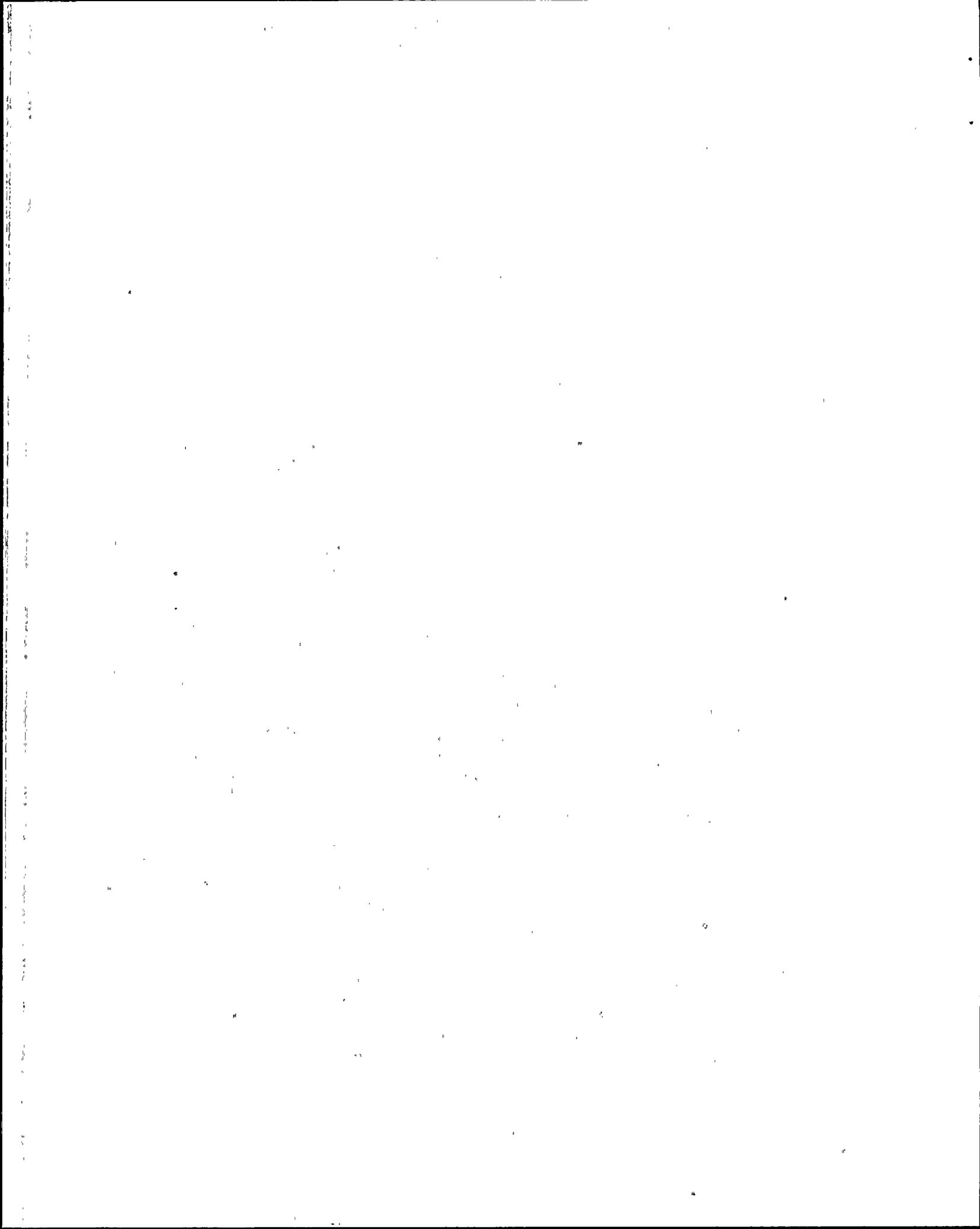
1. Analysis

The licensee's radiation protection program was evaluated during routine operations, outage periods, and during an emergency response to a steam generator tube rupture event. The inspection effort in this area consisted of 1 special and 10 routine inspections performed by resident inspectors and region-based radiation specialists. The NRC inspection staff devoted approximately 5 percent of the total inspection effort to this functional area.

Generally, the licensee's performance in the radiological controls area was satisfactory, but showed a decline in the performance of day-to-day radiation protection activities. This was exemplified by the numerous failures identified in the escalated enforcement action for an overexposure incurred during a radwaste evolution. During the previous assessment period, the radiological controls functional area received a Category 1 SALP rating. The previous SALP Board recommended that management attention should be directed toward assuring that basic radiation protection practices are consistently implemented and toward assuring that attention to detail is exercised. During this assessment period, the licensee's radiological controls performance during refueling outages was strong, and gave evidence of implementing the Board's recommendations; however, performance during day-to-day operations showed the need for additional management attention in some areas.

The licensee's Quality Assurance (QA) group was consistently involved in identifying areas where performance improvement was needed in this functional area. The number and quality of findings identified in the licensee's QA monitor reports were indicative of an effective program. Management response to QA findings was generally prompt and effective.

The licensee's approach to the resolution of technical radiological controls issues was in most cases thorough and technically sound. Problems sometimes recurred before they were effectively resolved. For example, early in the assessment period, multiple examples of radiation workers entering high radiation areas without appropriate



dosimetry were identified before the issue was resolved. Recurrent problems were also identified in movement, surveys, and control of low-level radioactive waste, e.g. movement of radwaste barrels and control of contaminated oil. Once the potential for the safety significance of problems was recognized, management involvement at the highest level was evident, and corrective actions were generally effective. Upper management involvement was exemplified in the investigation of the overexposure event. The root cause analysis and corrective actions for the event indicated a clear and thorough understanding of the issues.

During the Unit 1 refueling outage the licensee's approach to maintaining exposure ALARA was technically sound and effective as illustrated during work performed inside the steam generators. Also seen as a strength was the increased use of engineering controls to control airborne radioactivity during the Unit 3 refueling outage, significantly reducing the need for respirators and maintaining radiation exposure ALARA. Respirator usage dramatically decreased from approximately 5,500 per refueling outage to 411 for the Unit 3 outage.

As in the past, gamma and beta air dose to the site boundary from gaseous effluents was a small fraction of the Technical Specification limits. The most important strength in the licensee's radiation protection program continued to be the low personnel radiation exposures and a significant decrease in personnel contamination events. Personnel exposure for the site in 1992 was 527 person-rem, down from 602 person-rem recorded in 1991. Personnel contamination events were reduced from 295 in 1991 to 214 events in 1992.

Enforcement history in radiological controls indicated a lack of attention to detail during the first half of the assessment period; however, major violations were rare. One Severity Level III, ten Severity Level IV, and two non-cited violations were identified during the assessment period. Two of the violations were repetitive, and the Severity Level III violation contained numerous examples of failure to follow procedures. Additionally, one deviation was identified during the assessment period, regarding calibration methods for the containment high range radiation monitor.

The licensee completed its reorganization and filled key vacancies during the assessment period. Licensee management clearly showed initiative when they reorganized the Site ALARA group after the licensee identified significant weaknesses in the group's ability to perform its function due to lack of clear lines of authority and responsibilities. The reorganization also increased the availability of expertise within the group. Late in the assessment period the licensee abolished the position of Radiation Protection Operations Manager when the position became vacant.

2. Performance Rating

Performance Assessment - Category 2

3. Board Recommendations

The licensee should ensure continuation of strong radiological controls performance during outages, and direct a corresponding level of management attention to improve performance in day-to-day radiological activities. Management's expectations regarding procedure adherence and attention to detail should continue to be emphasized to radiation protection personnel as well as other workers.

C. Maintenance/Surveillance

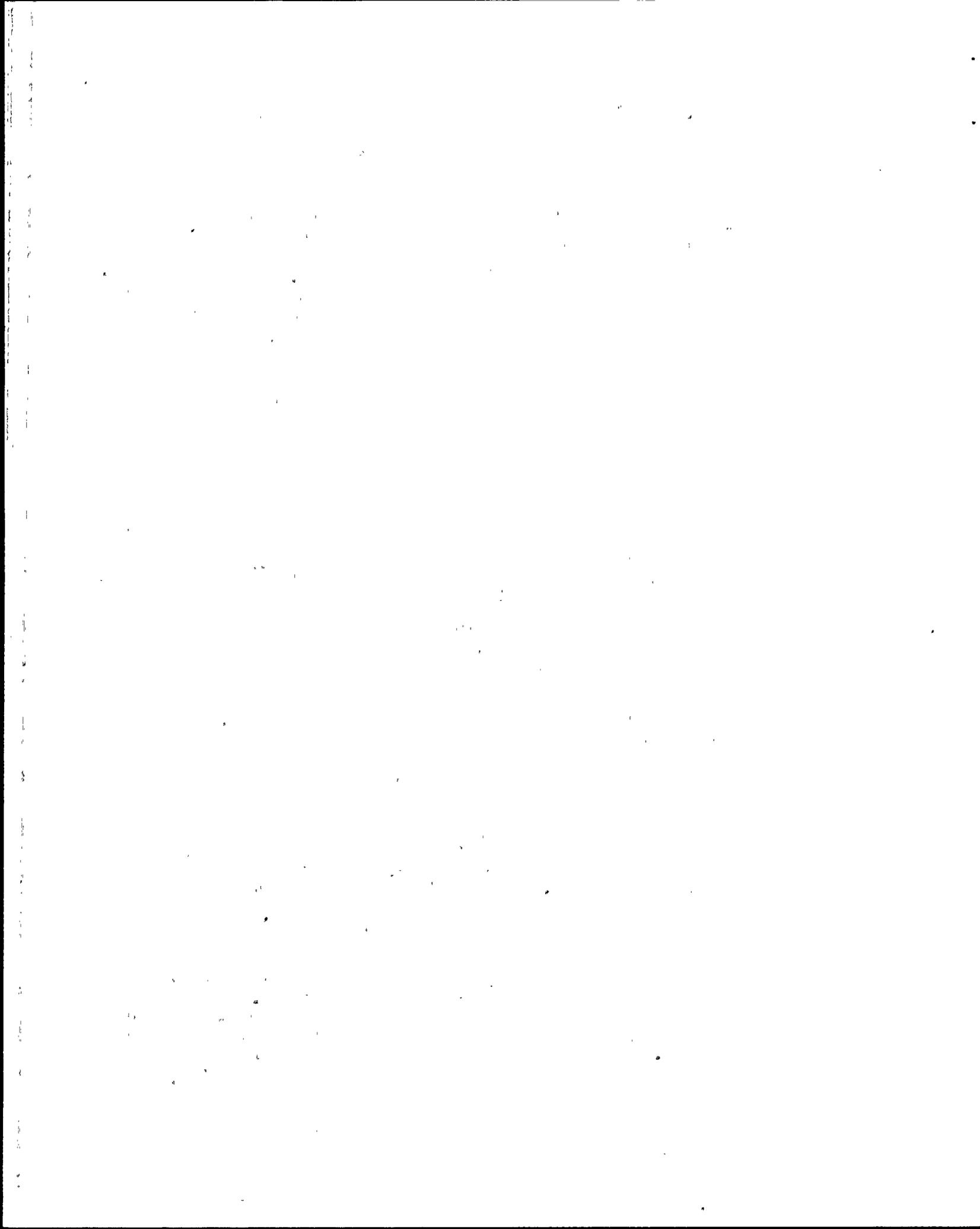
1. Analysis

This functional area was observed routinely during the assessment period by both the resident and regional inspection staff. The NRC devoted approximately 16 percent of the total inspection effort to this functional area.

Three areas of maintenance weaknesses were identified during the previous SALP period: worker performance, licensee identification and corrective action of deficiencies, and work planning and scheduling which impacted plant operation.

Overall, the maintenance program effectiveness has remained about the same as the previous SALP period. Significant weaknesses include worker performance, procedure adherence, and procedure quality. Noted strengths included the Maintenance Assessment Program, the formation of three new organizations, the personnel rotations between maintenance departments, the aggressive implementation of the concepts contained in the maintenance rule (taking a leadership role among Region V utilities), and initiatives which acknowledge and address human performance problems. Also, the licensee's control of work appears to have improved during this assessment period.

Human performance problems dominated NRC concerns in the maintenance area during this SALP period. Workers' performance errors resulted in several events including a lifted annunciator lead contacting a 480 V bus which disabled most annunciators and resulted in an Alert; a reactor trip breaker (RTB) was degraded by poor work practices; and two check valves were found to have been improperly reassembled, including a containment isolation valve which was inoperable for an entire operating cycle. Numerous lifted lead and temporary test lead issues were identified including two instances identified by the NRC in which test leads were installed for several weeks after work had stopped, and an instance where an unrestrained lifted lead contacted a test probe.



In recognizing this problem, the Maintenance Department revised its self-monitoring program and by the end of the SALP period was identifying more deficiencies than the Quality Assurance department. In response to the civil penalty issued for violations associated with control of work, the licensee developed a sensitive issues program to raise the visibility of activities which have a greater impact on safety.

The NRC identified several examples of workers failing to follow procedures, including an auxiliary feedwater valve not properly reassembled, a fire protection technician not following the fire protection system test procedure, a local leak rate test technician not performing an independent verification in accordance with the procedure, and two examples where a work group supervisor did not follow administrative requirements.

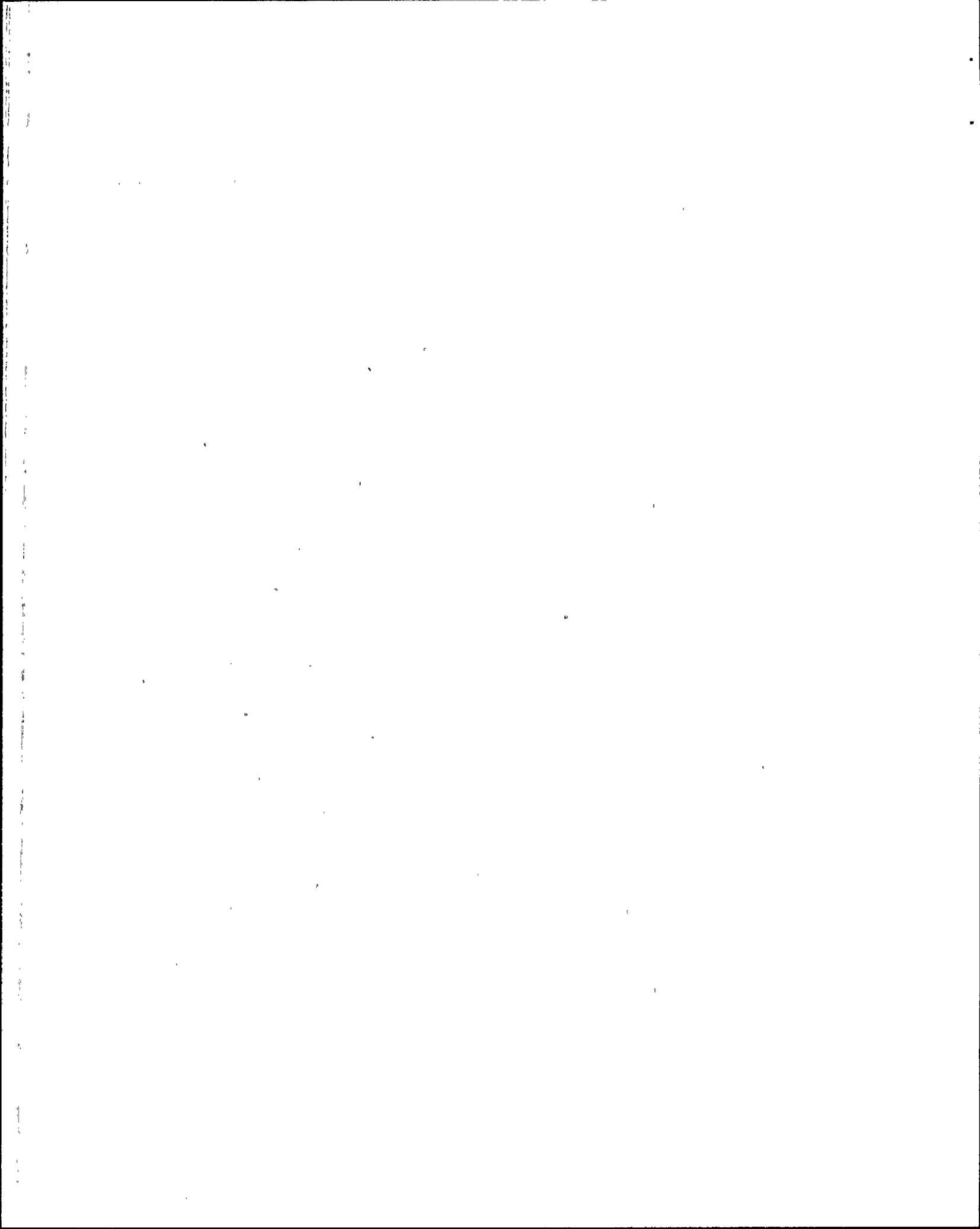
Several work documents did not follow vendor guidance. Numerous deficiencies were identified with reactor trip breaker (RTB) maintenance following the failure of a Westinghouse (W) RTB to open and a General Electric (GE) RTB to remain closed. These deficiencies included the use of an unapproved lubricant on both GE and W RTBs, the failure to use the latest GE and W vendor guidance, and the failure to take measurements, make adjustments, and sequence work steps in accordance with vendor recommendations. The failure to implement vendor guidance also contributed to a reactor trip caused the improper operation of a negative sequence relay, a potential problem which had been previously identified.

Other procedural weaknesses contributed to maintenance deficiencies. Several safety-related breakers were rendered inoperable due to inadequate procedural guidance. The maintenance procedure for closing the containment equipment hatch was not sufficiently specific to ensure containment closure.

Administrative deficiencies caused additional concern. A condensate pump was tripped necessitating a prompt power reduction due to the use of a work order in Mode 1 which was intended to be used in Modes 5 or 6. The licensee's programmatic definition of work required revision after workers removed and tested a safety-related breaker without work documentation. The licensee implemented an inoperable annunciator disabling program without adequate procedural controls.

Surveillance test scheduling and performance were generally good during this SALP period. However, near the end of the period, a significant disparity was identified by the NRC regarding the snubber testing program, resulting in the licensee requesting and receiving enforcement discretion pending approval of an emergency Technical Specification amendment.

The 12 violations in this functional area during this SALP period were higher than the six violations during the previous SALP



period. The nine Licensee Event Reports (LERs) were also higher than the seven in the previous SALP period. The Severity Level III violation in this area was noteworthy because it was a four part violation involving three different maintenance activities.

Maintenance staffing during the SALP period was sufficient. The corrective maintenance backlog was reduced 42% to below 4000 work orders. Similarly, the overdue preventive maintenance work orders averaged 3% during the SALP period, a 50% reduction. A reorganization of the Maintenance Department included the creation of a Valve Services organization which grouped engineering, work control, and maintenance under a single manager to concentrate efforts on improving the reliability of valves. The Maintenance Support organization was formed to coordinate maintenance and engineering to prepare for implementation of the maintenance rule. A Refueling Services organization grouped refueling, engineering, and reactor vessel maintenance expertise. The rotation of maintenance foremen, supervisors, and managers between units resulted in significant sharing of ideas and in improved communication within the maintenance department. The licensee also initiated a self-assessment of maintenance training.

In summary, the overall performance remained the same during this SALP period. Improvements in self-assessment were offset by continued worker performance deficiencies reflecting ineffective communication of performance expectations to the workers. Several maintenance initiatives have been established and their effectiveness will be reviewed in the next SALP period.

2. Performance Rating

Performance Assessment - Category 2

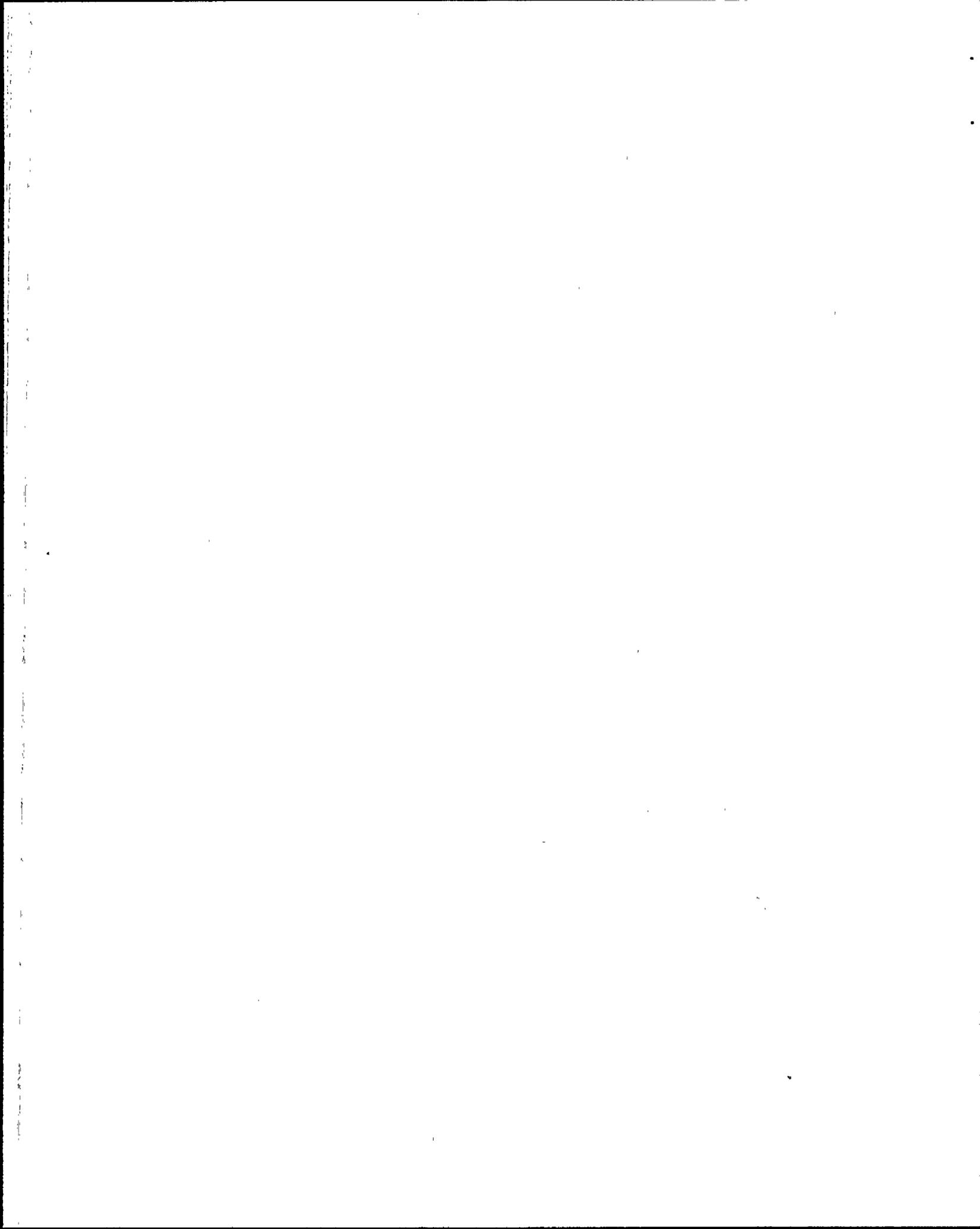
3. Board Recommendations

Management should continue efforts to communicate performance expectations to all levels of the maintenance organization such that personnel feel accountable. Followup should occur such that management is aware if expectations are being met. Efforts to improve the quality of procedures and procedural adherence should continue.

D. Emergency Preparedness

1. Analysis

One routine emergency preparedness (EP) program inspection, two Augmented Inspection Team (AIT) inspections with event response observations, one special AIT followup inspection, and two annual emergency exercise team inspections were conducted during the assessment period. Review of the EP program accounted for approximately 3 percent of the Palo Verde inspection effort.



EP performance in the last SALP cycle was rated as Category 1. The SALP board made one recommendation: that the licensee should ensure that response personnel participate in a manner that will maximize the effectiveness of exercise performance. The recommendation was addressed by the licensee such that in the 1993 exercise, the inspectors noted active and realistic participation by licensee personnel. Significant strengths noted during the SALP period included the continuing involvement of the Quality Assurance (QA) organization in the EP program and the large number of qualified staff which allowed continuous staffing of the emergency response facilities during the three day Alert in April 1992 and during the March 14, 1993, steam generator tube rupture (SGTR) event. A significant weakness noted was the licensee's performance of assembly and accountability during the March 14, 1993, event. Contributing to the performance problems were deficiencies in General Employee Training, which had been previously identified, and in Emergency Plan Implementing Procedures.

Licensee management is frequently and effectively involved in the EP program. This is demonstrated by providing the resources necessary to maintain and enhance the program. For example, the licensee completed the development of a basis document for the Emergency Action Levels (EALs). A facility walkthrough program was continued in order to maintain facility readiness. Management supported an enhanced drill and exercise program. Management also supported the inclusion of the probability risk assessment and degraded core groups working with EP in exercise scenario development and in event response. Management has continued to support good relations with offsite organizations.

The licensee's QA program was actively involved in the EP area as evidenced by an in-depth annual QA audit. Additionally, the EP staff routinely utilized QA evaluations for review of EP exercises and drills. The quality programs also demonstrated their involvement by the in-depth investigations which were performed to evaluate the 1992 loss-of-annunciator event and the 1993 SGTR event. The licensee's EP action item tracking system was utilized effectively in tracking to completion identified program improvements.

When technical issues were identified, the licensee demonstrated a clear understanding of the issues involved and has routinely exhibited a conservative attitude when potential safety significance existed. Resolutions have generally been timely and sound, and problems have seldom recurred. Examples included the correction of problems identified during exercises, drills, and events, making necessary clarifications for EALs, effective and timely resolution of deficiencies identified by QA, and conducting several unannounced assembly and accountability drills. Management has also responded to NRC findings indicating a need for corrective action. For example, in response to an NRC concern in the 1992 exercise regarding the level of technical support participation,

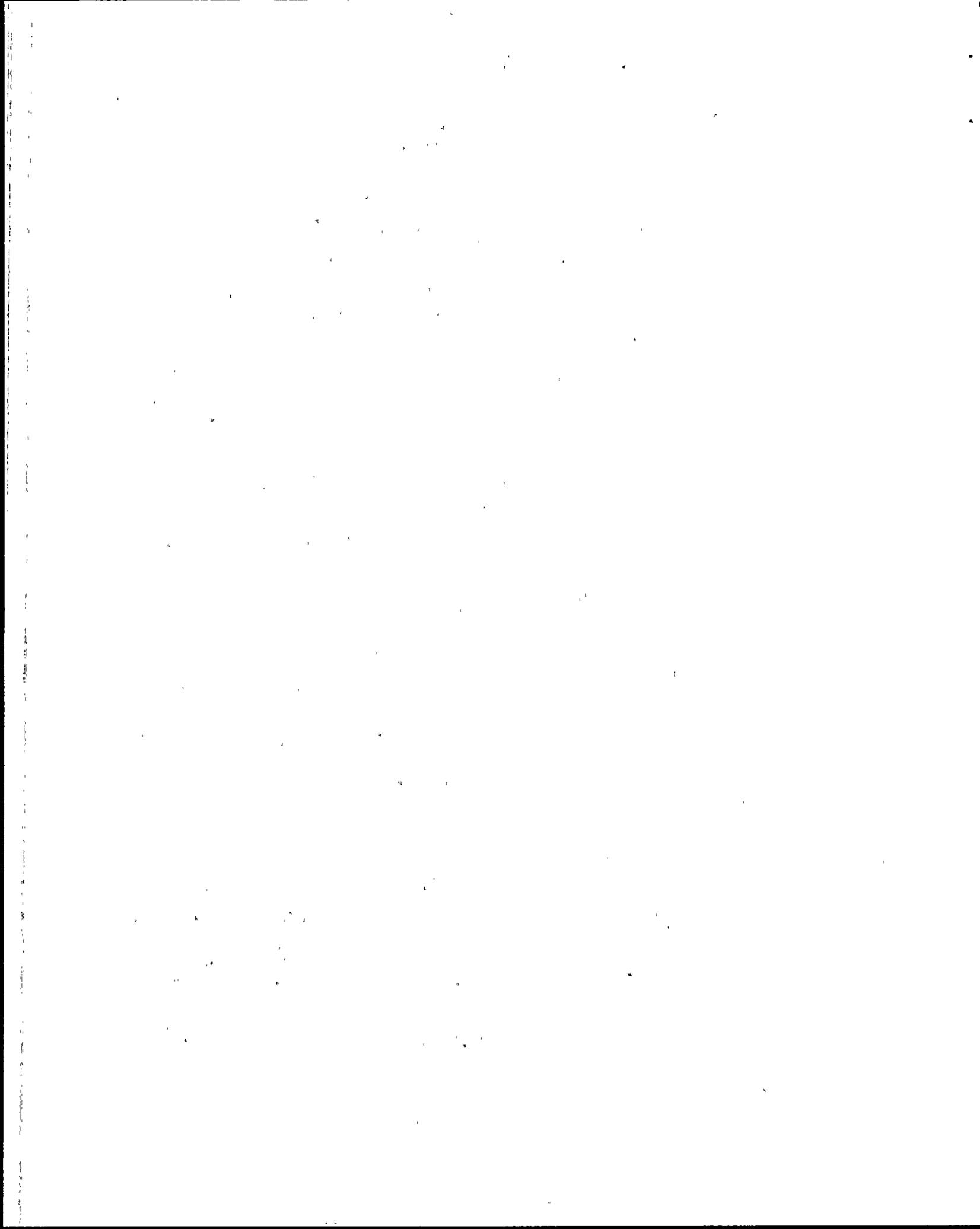
the licensee showed significant improvement in the 1993 exercise. Also, when a concern about the time to classify an event was identified, the licensee changed the thirty minute guideline to "as soon as possible."

There was one violation issued during this SALP period for failure to classify the loss of the meteorological tower as an Unusual Event. There were several enforcement issues pending at the conclusion of the SALP period resulting from the March 14, 1993, SGTR event.

An EP exercise weakness was identified during the 1992 annual emergency exercise concerning the Operations Support Center health physics practices; however, no weaknesses were noted during the 1993 exercise. Six emergency declarations were made during this assessment period. Four of the declarations were Unusual Events and two were Alerts. The licensee demonstrated excellent performance in responding to the April 1992 loss-of-annunciator event. The event was properly classified, and the licensee was able to staff the emergency response facilities continuously for three days until the event was terminated. The licensee's staffing and control of the March 1993 SGTR event was also excellent; however, significant deficiencies were identified in the licensee's response. This event was classified as an Alert when procedures would have required classification as a Site Area Emergency. Although the Alert classification is consistent with the NRC guidance for steam generator tube leaks, and the NRC agrees that the licensee's procedure required an inappropriate classification, deviation from an approved emergency procedure during an event is not a proper action. Also, during the March 1993 SGTR event, the time required by the licensee to complete assembly and accountability was excessive, and emergency response facilities did not meet activation goals.

EP staff members appeared conscientious toward accomplishment of their assigned duties. Sufficient staff was provided to implement the programs and to interact appropriately with offsite agencies. Emergency response organization positions were identified; responsibilities and authorities appeared clearly defined; and key positions were filled as appropriate. Decision making authority appeared properly delegated.

The licensee's training program met or exceeded NRC requirements. The licensee used a combination of computer-based and classroom-based training for emergency response personnel. In addition to the required annual exercise, the licensee is conducting a quarterly training exercise such that each unit participates annually. The licensee's evaluation of the March 14, 1993, failure to perform timely accountability indicated that inadequate training of some members of the security force and negative training of plant personnel during drills may have contributed to the inability to conduct assembly and accountability.



2. Performance Rating

Performance Assessment - Category 1, Declining

3. Board Recommendations

The licensee should review the emergency classification procedures to assure that emergency events will be classified at the appropriate level. Also, the licensee needs to effectively demonstrate the ability to account for personnel during an emergency.

E. Security

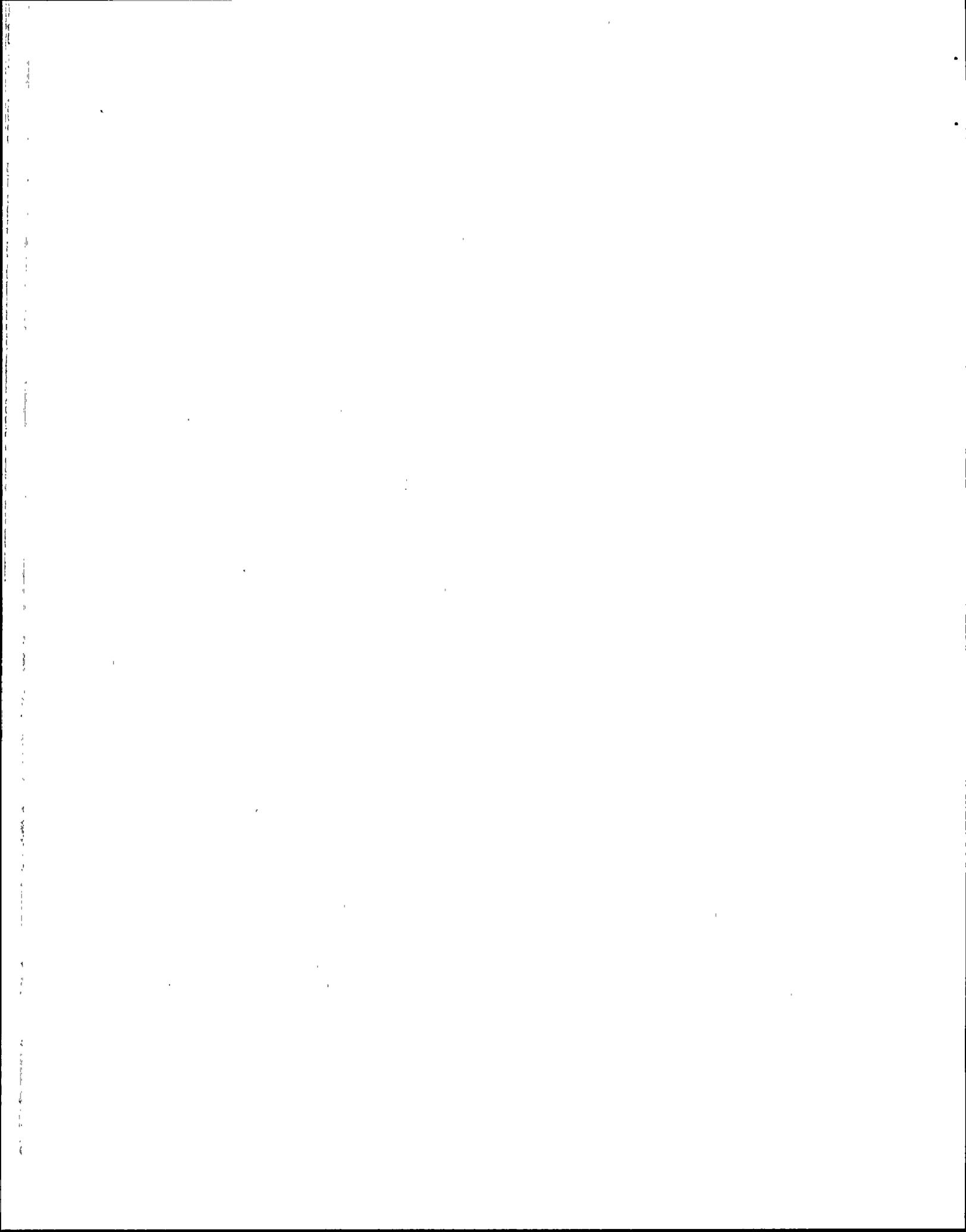
1. Analysis

Four routine security inspections were conducted during this SALP assessment period. Approximately 5 percent of the total inspection effort was expended in this functional area. In addition to region-based inspections, the resident inspectors also monitored implementation of this program as part of their routine inspection activity.

During the previous SALP period, the licensee's performance in this functional area had been rated as Category 2. The Board recommended that security management implement a program to effectively identify and evaluate the root cause of problems, assure implementation of identified corrective actions, and increase the frequency of management involvement in the day-to-day operation of the uniformed security force. Further, the Board also recommended that licensee management stabilize their security organization and continue their efforts with the Security Equipment Improvement Plan. These actions have been completed.

During this SALP period, the licensee's overall performance in the areas of physical security and fitness for duty generally remained unchanged. Program strengths during this period included upgrading portions of security alarm equipment, perimeter fences, and security lighting. Additionally, the licensee reduced the frequency of security officer human errors. Program weaknesses identified during this period included the continued low morale of uniformed security officers and the inability of the security organization to complete timely assembly and accountability during the March 1993 steam generator tube rupture (SGTR) event.

During this SALP period, the licensee stabilized the size and composition of their proprietary and contract uniformed security force. However, as evidenced by a comparatively large, and increasing number of concerns received from security officers by the NRC and the Department of Labor, it appears that the overall low morale of these security officers resulting from strained management/labor relations remains unchanged. Additionally, some



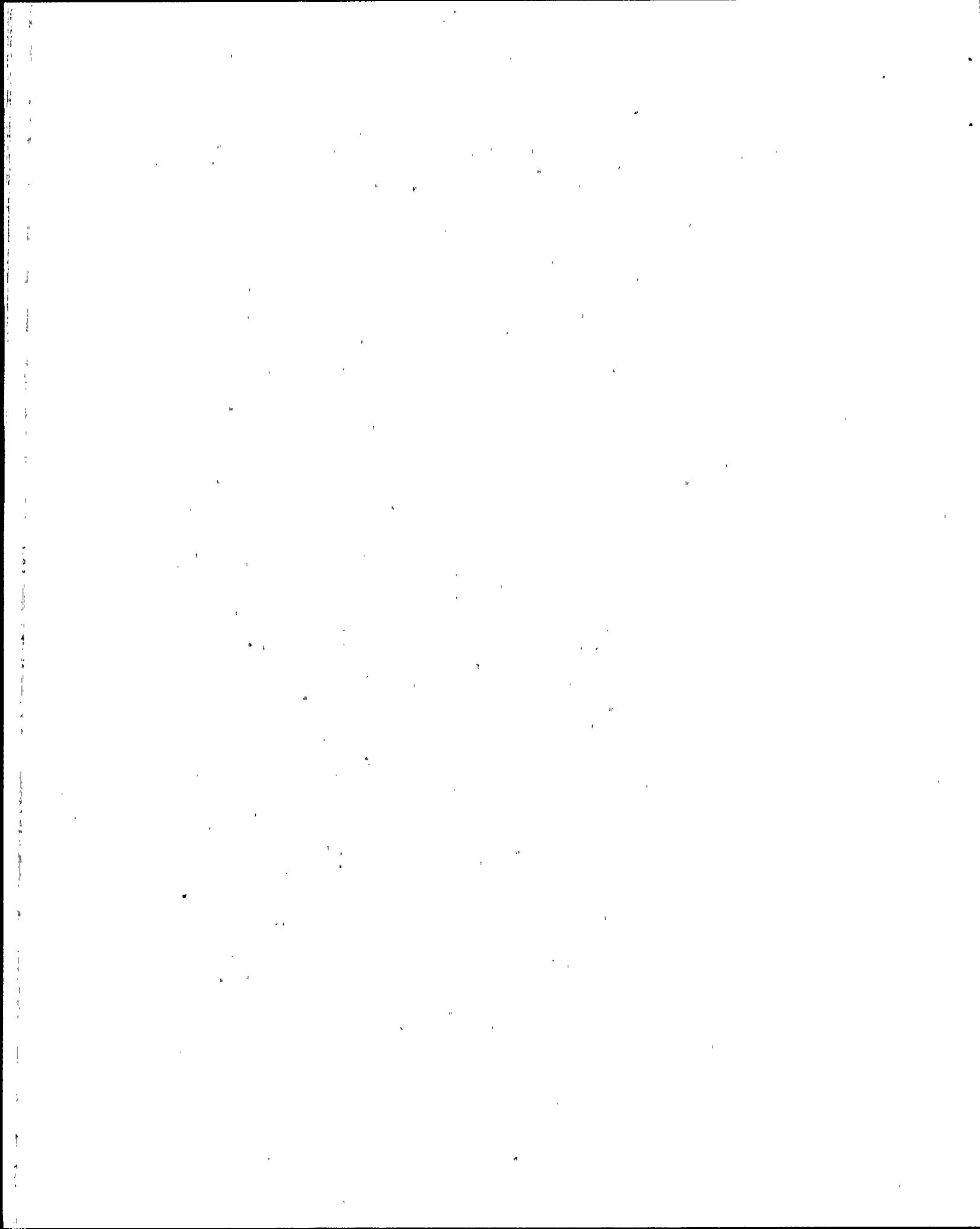
of the security officers have indicated that they feel uncomfortable in making recommendations to security organization management, or reporting security concerns through the Employee Concerns Program. This lack of good communications within the security organization has inhibited feedback to management and prevented the licensee from taking timely corrective actions to resolve officer concerns and improve performance.

With regard to management's involvement in assuring quality, the licensee's Quality Assurance staff continued to provide frequent, effective, and professional review of the overall security program. Additionally, during the SALP period, security management arranged for all security personnel to receive team-building training.

The licensee's approach to resolving technical issues generally demonstrated sound judgement and a commitment to safety. During this period, the licensee's Security Equipment Improvement Plan continued to focus on improvements in vital door locking mechanisms, perimeter security alarm equipment, perimeter fences, and closed circuit television cameras. At the end of the SALP period, the licensee had completed a significant portion of the upgrades to this equipment. Further, a security organization task force updated security procedures and post orders.

Enforcement actions during the assessment period included identification of one Severity Level V violation and two non-cited violations that addressed situations in which the licensee failed to properly maintain a perimeter fence, protect safeguards information, and conduct unannounced random fitness-for-duty tests. Additionally, during this assessment period, the NRC Office of Investigations (OI) completed a review of the security organization's conduct and documentation of their 1991 basic security training classes. OI determined that portions of the training was incomplete and the records were inaccurate. During a May 1993 enforcement conference to review the results of these OI investigations, Region V noted that the licensee's corrective actions in this area appeared to be thorough and had corrected the previous deficiencies identified by OI and the licensee. Further, the inability of the security organization to properly conduct personnel assembly and accountability during the March 1993 SGTR event is being reviewed for enforcement action.

During the SALP period, the licensee's logged safeguards events were reviewed and reported to the NRC as required. The licensee has reduced the frequency of security officer human errors, and thereby reduced the number of logged safeguards events. However, a significant number of events are still being reported each quarter. Upon completion of upgrading security equipment, the licensee anticipates a further reduction in the number of recorded safeguards events. During this period, the licensee reported no one-hour security events to the NRC.



With respect to staffing, key positions were identified and were filled the majority of the time. Position responsibilities were generally well defined.

During this SALP period, the licensee's security training staff was responsible for continuing the training of proprietary and contract security officers. As a result of licensee-identified training problems, and similar problems identified by the 1991-1992 OI investigations, the licensee's security officer training program was improved and includes issuance of a security personnel handbook and performance based testing of on-duty security officers. However, additional improvement appears to be necessary as indicated by the weaknesses in the licensee's implementation and documentation of the roving fire watch program (See Section III.A.1 of this report) and the training weaknesses of the security supervisors identified by the March 1993 SGTR event.

The licensee's fitness-for-duty program, though not inspected this SALP period, continues to include the use of a lower cutoff level for marijuana, testing for a larger number of drugs than NRC requires, and an internal self-assessment program.

2. Performance Rating

Performance Assessment - Category 2

3. Board Recommendations

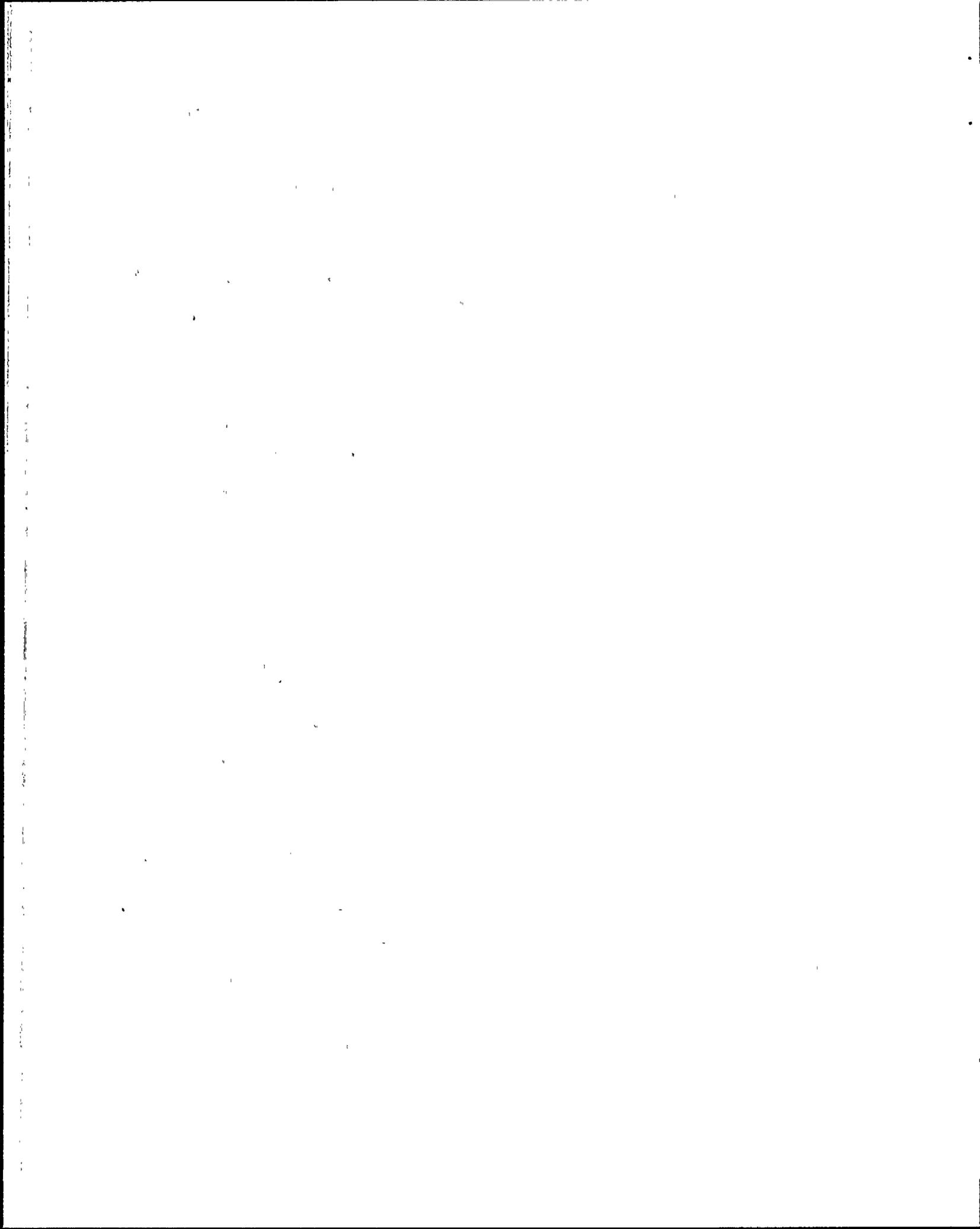
The licensee should work to improve the working relationship between security managers and officers to enhance feedback and promote improved performance. Licensee security management should ensure that all members of the security force have received sufficient training to adequately support all emergency situations and continue their efforts with the Security Equipment Improvement Plan.

F. Engineering/Technical Support

1. Analysis

During the assessment period, nine engineering inspections were conducted, including a special inspection of reactor trip circuit breakers and an Instrumentation and Control (I&C) team inspection. In addition, resident inspectors regularly monitored engineering performance. The I&C team inspection emphasized review of engineering support for plant design and operation. Engineering inspections constituted 5 percent of the total inspection effort during this SALP period. Ongoing assessment was also provided by NRR.

The previous SALP Board rated this area as Category 2 and recommended that the licensee continue to ensure timely involvement



of engineering organizations in plant problems and improve trending of plant problems.

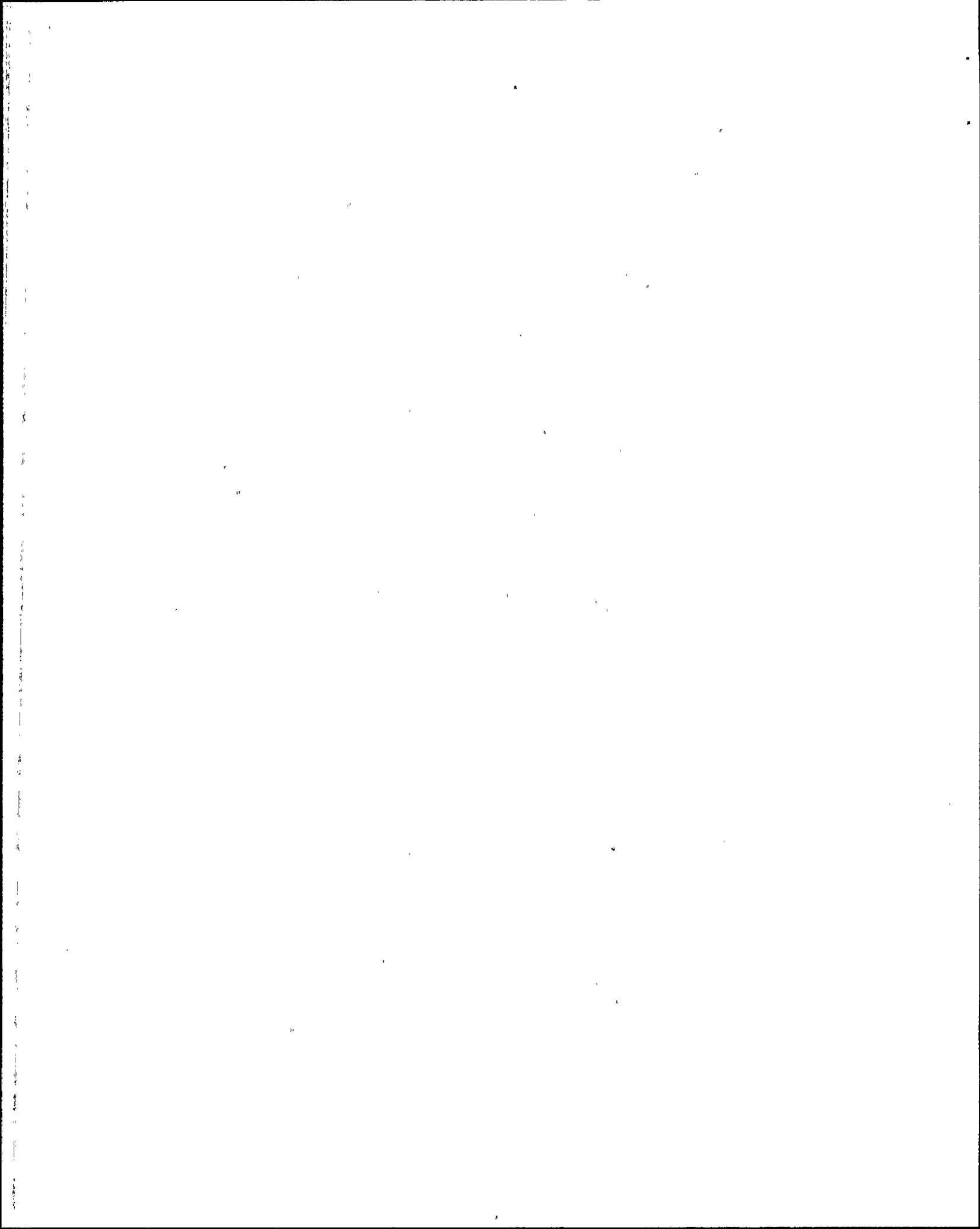
Engineering management during the present SALP period was characterized overall by strong staffing and financial support for engineering programs, but included examples of weak oversight of these programs. Engineering management strengths were noted in the strong management support for the I&C setpoint program, the probabilistic risk assessment (PRA) program, the check valve program, and the new system based trending program. However, examples of weak management oversight included out-of-date check valve program documentation and supervisory engineering approval of improperly completed design change packages.

Engineering strengths included an effective self-assessment program and detailed root cause evaluations of reactor trip circuit breaker failures, an emergency diesel generator air start valve failure, and a steam generator tube failure. The licensee formed task forces which included industry experts to evaluate the reactor trip breaker failures and the steam generator tube failure.

An additional engineering strength was noted in the Reload Analysis Methodology Report submitted by the licensee to the NRC in support of its plan to begin to design core reloads in-house, without the support of Combustion Engineering (CE). An NRC audit concluded that APS had a comprehensive understanding of reload technology and had properly applied the CE methods and models. The audit also concluded that the licensee was capable of designing future Palo Verde fuel cycles.

Engineering weaknesses included failure to properly trend and review repeated out-of-tolerance instrumentation data. Inadequate engineering reviews of design modifications were noted: an example was the inadequate review of system design during development of retesting for a design change to the steam bypass control system. The inadequate review resulted in an inadvertent opening of steam bypass control valves during plant operation.

The licensee's resolution of technical issues from a safety standpoint included strengths such as two separate examples of thorough analyses of core protection calculator functions, conservative evaluation of operation of the reactor power cutback system, use of PRA in decisions affecting safety equipment, and a strong program for assessing steam generator integrity. However, a notable weakness in this area was the failure to properly investigate a vendor notice of a potential for reactor trip circuit breakers to fail to open. Inadequate engineering review of vendor information was also a contributing cause of an improperly assembled check valve and a unit trip caused by a relay previously noted by the vendor as potentially faulty (See Section III.C.1 of this report). Technical review and control of vendor information was a continuing problem which the licensee had not effectively



addressed.

Two violations and one deviation were identified in the engineering and technical support area. The violations identified a failure to properly evaluate a non-conforming check valve condition, and failure to properly review a design change package. The deviation identified that 14 personnel in engineering did not meet the education requirements of their position descriptions.

The licensee issued five event reports (LERs) during the assessment period concerning engineering issues. These reports concerned failure to install seismic restraints in instrument cabinets, three examples of potential failure of both trains of safe shutdown equipment due to fires, and a unit trip which occurred due to a relay design problem which had been previously identified by a vendor service bulletin. Except for the unit trip, the LERs in this area were the result of design reviews. Although these LERs reflect an engineering strength in identifying design problems, the three fire protection design problems are similar to previously identified fire protection system design problems, and indicated a need for continued engineering design review efforts.

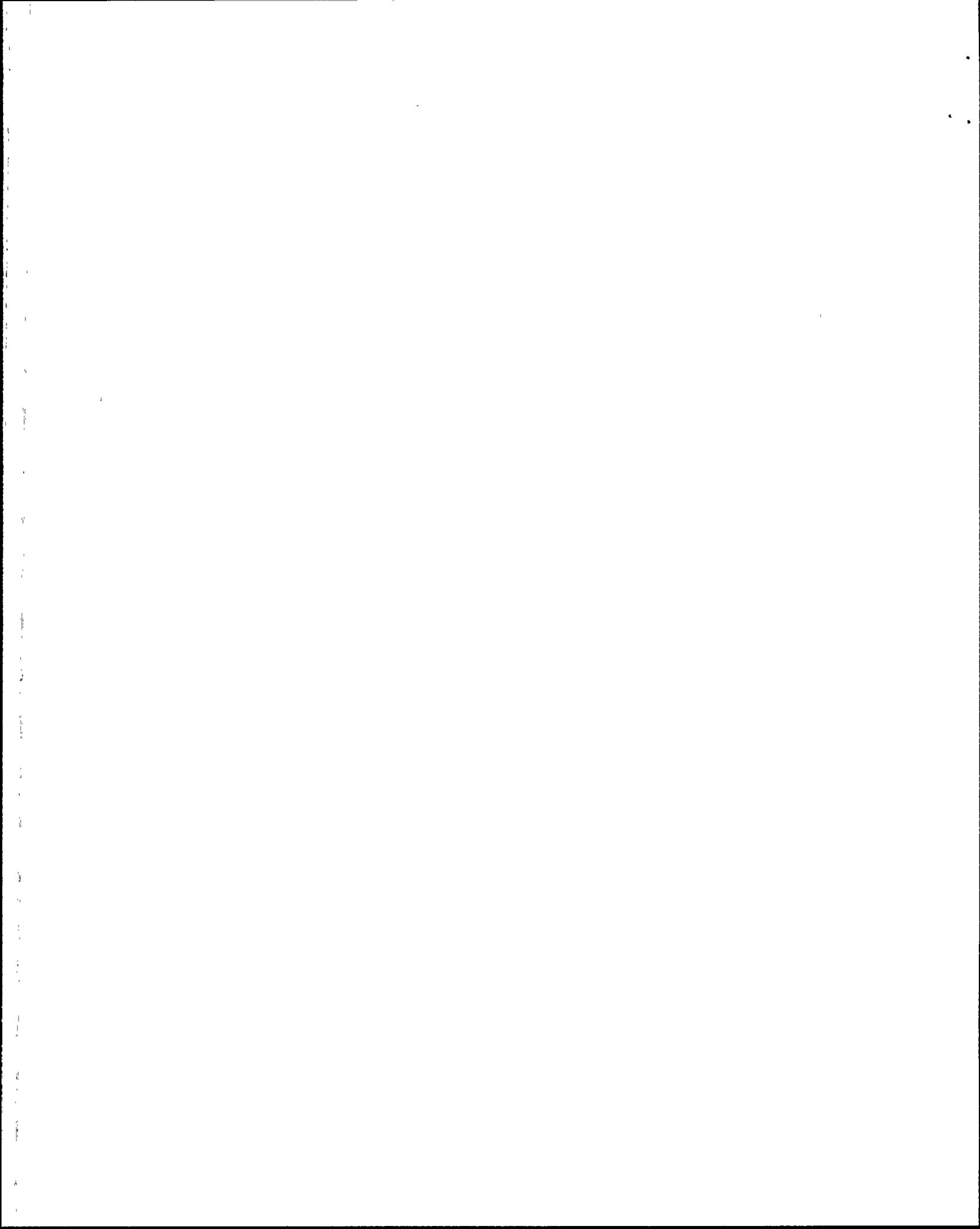
During the present SALP cycle the licensee made significant changes to the site engineering organization. The licensee indicated that these changes were made to provide better support of plant operations, more evenly distribute workload, provide better plant performance trending, and reduce reliance on contractors. The changes included assigning two engineers to monitor each of 18 safety significant systems. One engineer monitors performance trends and the other handles daily maintenance and operation. Since these changes were made in the middle of the SALP cycle, it was judged to be too early to evaluate the effects of these changes, although there were indications of improved system performance monitoring. The licensee also announced that a further engineering management reorganization was planned for July 1993. Engineering staffing appeared to be adequate, including a well staffed and managed PRA organization.

2. Performance Rating

Performance Assessment - Category 2, Improving

3. Board Recommendation

The board recommends continued strong management oversight for engineering programs to ensure that improved performance is maintained.



G. Safety Assessment/Quality Verification

1. Analysis

During this assessment period, the resident, region-based, and headquarters inspection staffs devoted approximately 19 percent of the total inspection effort to this functional area.

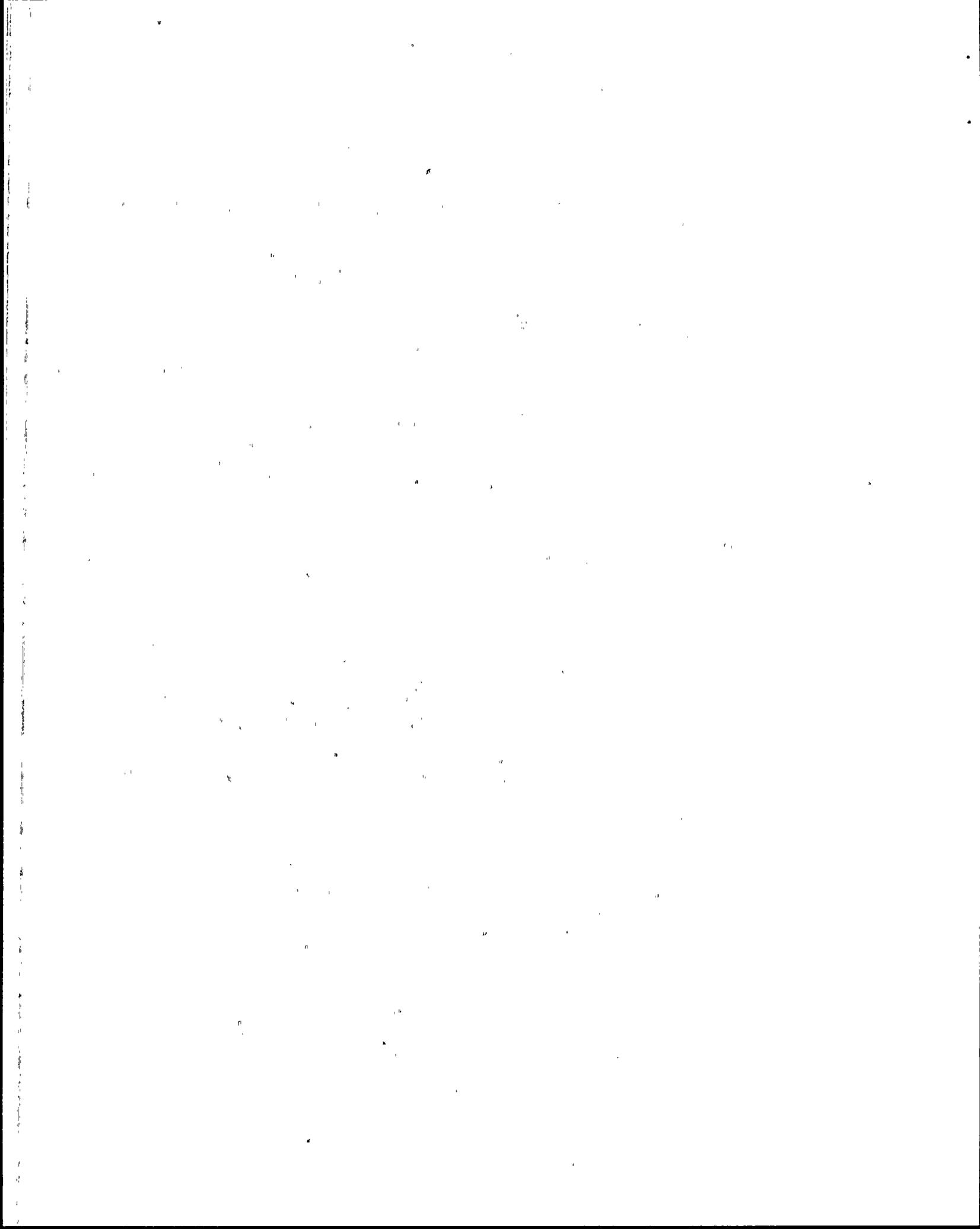
The NRC rated the licensee's safety assessment/quality verification (SAQV) performance in the last SALP period as Category 2. Strengths were noted in the audit program, and improvements were observed in the performance of the Plant Review Board (PRB) and Offsite Safety Review Committee (OSRC). Weaknesses were noted in the utilization of audit results and lessons learned from industry events, and in the effectiveness of Independent Safety Engineering (ISE).

Overall performance in this functional area has improved modestly during this SALP period. The licensee better utilized audit results and substantially improved the effectiveness of ISE. Quality Control (QC) was effective in identifying and communicating deficiencies. The quality of licensing submittals improved, and oversight organizations continue to be strong. However, evaluation of self-identified deficiencies and verification of resulting corrective actions were not thorough, and high human error rates indicated the need for better self-checking by all organizations. Reviews of industry events and trending of deficiencies were average.

During this SALP period the licensee made some significant changes. The graded approach to quality assurance was implemented with the issuance of the Operations Quality Assurance Plan, enabling better utilization of Quality Assurance (QA) resources. ISE was realigned under Technical Quality Engineering. Several QA organizations added formerly licensed or certified reactor operators to their staffs, significantly enhancing the licensee's ability to perform meaningful assessments of operations activities. A new Director, Quality Assurance, was named to fill a vacancy existing from January through May 1993.

The licensee's QA audit program continued to be very strong. The several audits reviewed were broad in scope and of sufficient depth to uncover several significant programmatic weaknesses. The Quality Monitoring program was also effective in identifying deficiencies. Better communication of concerns contributed to improved management utilization of audit results.

The problem identification program continued to be generally effective in identifying, evaluating, and correcting deficiencies. Significant deficiencies were usually documented, though pockets of resistance to the licensee's problem identification philosophy remain. Administration of the Condition Report/Disposition Request



(CRDR) process was effective and timely. However, the evaluations did not consistently result in timely implementation of effective corrective actions. For example, 22 corrective action documents were written over the last two years related to lifted/landed leads, and problems persist. A large number of CRDRs were determined by the QA organization to have been inadequately evaluated (20%) or to have corrective actions documented as completed that were not complete (10%). These highlight the need for more thorough oversight of CRDR categorization, evaluation, and corrective action implementation.

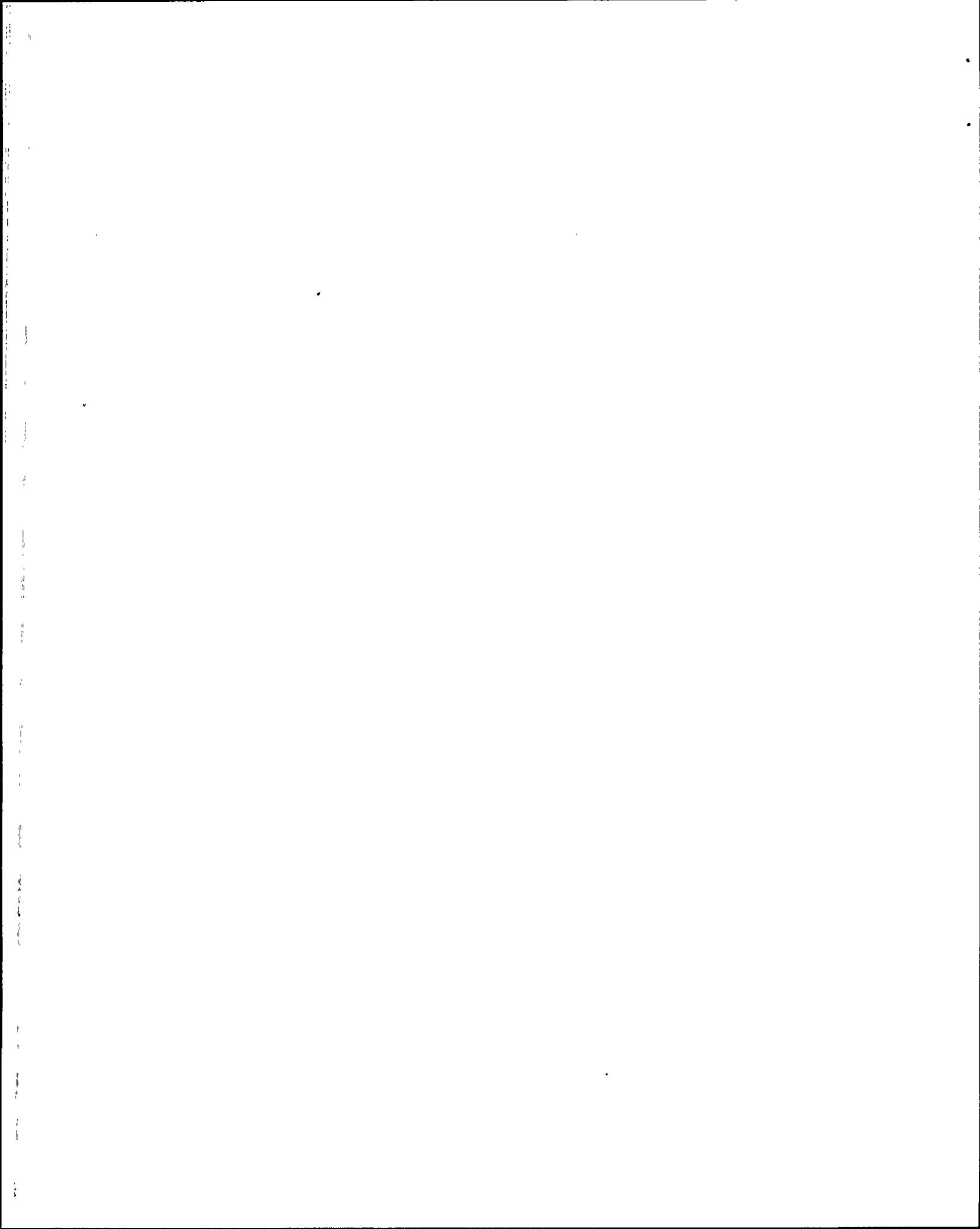
The Quality Control organization has made good contributions to improving plant activities by identifying and effectively communicating many deficiencies. Many items were "corrected on the spot" and referred to line supervision for followup. Good practices were noted regarding oversight of QC inspectors, and continued use of a "lessons learned" briefing book and an inspection checklist. Despite the overall good program, QC failed to identify the misplugging of a Unit 2 steam generator tube, demonstrating that corrective actions from two previous events were ineffective.

Human performance errors were prevalent in most licensee organizations, as highlighted in the Performance Assessment Report, inaugurated toward the end of the SALP cycle to improve communication of trending results. The licensee initiated a seven-step self-verification program and other measures to improve in this area. Late in the SALP cycle, the licensee developed a new "Human Error Reduction Objective" program. These efforts are clearly warranted.

The PRB and OSRC were aggressive and insightful in their evaluations. The PRB effectively focused on nuclear safety issues, while also providing meaningful comments on other issues. Management of PRB open actions also improved. The OSRC continued to benefit from the perspectives provided by external members. The OSRC has contributed to directing management attention to significant personnel performance issues, emphasizing that management is responsible for effectively communicating its expectations.

ISE has substantially improved in effectiveness, providing meaningful and timely recommendations to line management regarding significant safety issues. For example, ISE identified several concerns regarding preparations for Unit 1 reduced-inventory operations. ISE has a small, but well-qualified staff. Despite being highly reactive, ISE conducted thorough reviews in several areas. ISE effectiveness could be enhanced by using trending results to help focus resources.

The licensee's review of industry events was generally timely but inconsistent. While some NRC Information Notice reviews were well



done, other reviews were not thorough or were too narrow in scope. Followup for actions resulting from the reviews was also mixed.

Licensing submittals have improved in quality and completeness over this SALP cycle. However, 13 followup information submittals related to a Technical Specification amendment request were not assessed by the licensee for impact on the request, necessitating an NRC request for clarification. A change to the Updated Final Safety Analysis Report created a deviation related to qualification of engineering personnel. The original LER addressing incorrect installation of a check valve in Unit 1 did not assess associated Technical Specification and ASME requirements and incorrectly stated that the event was an isolated case. Continued attention is warranted in this area.

Three cited violations and two LERs were directly attributed to SAQV, compared to none the previous cycle. The violations reflected failure to take corrective action for instruments that were frequently out of tolerance during calibrations and failure to adequately verify completion of corrective actions for nonconforming conditions. The LERs both addressed vendor quality issues.

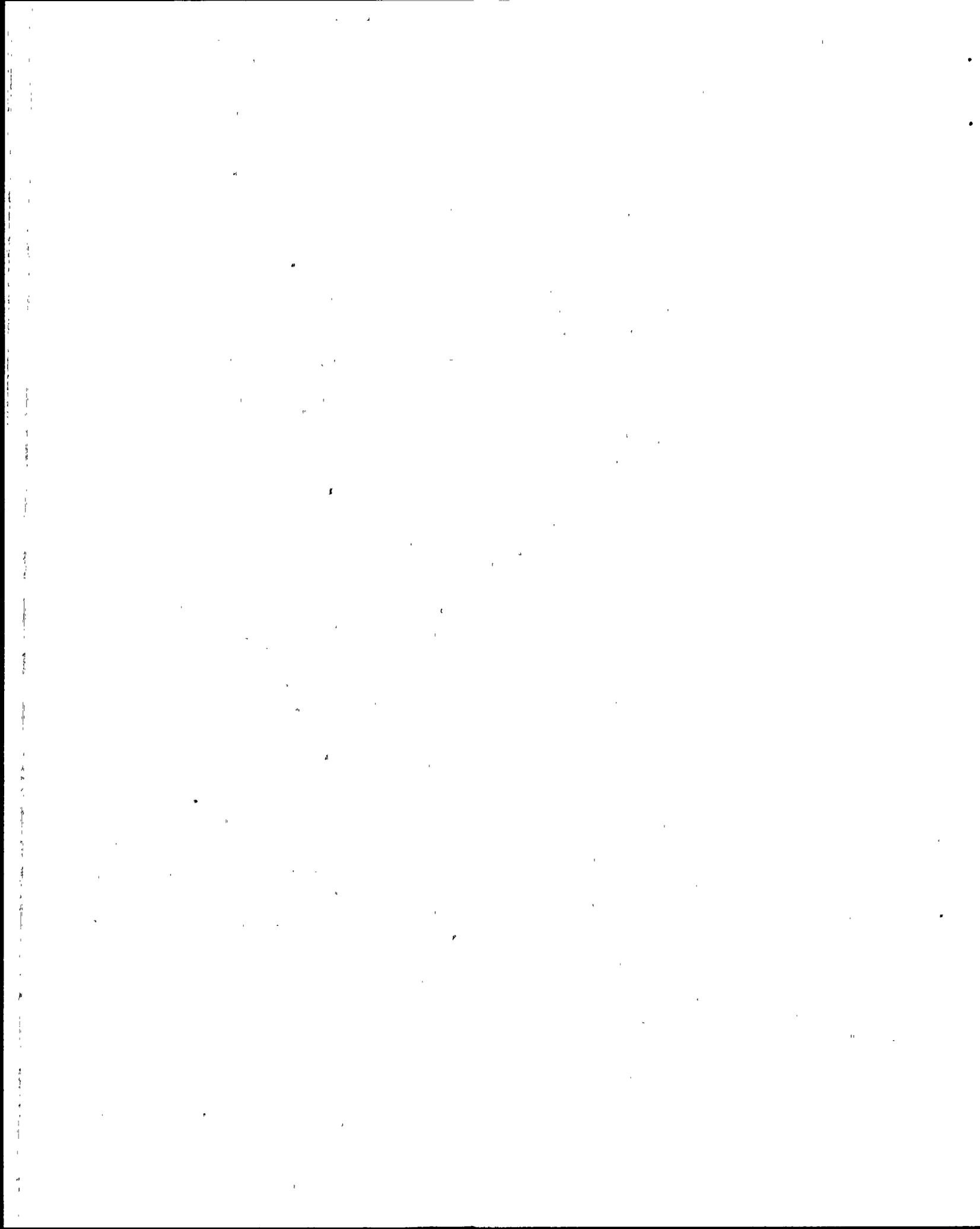
During the assessment period, Administrative Law Judges (ALJs) for the Department of Labor issued recommended decisions against the licensee for three cases in which employees were discriminated against. In addition, the number of concerns provided to the NRC for Palo Verde is the highest of any Region V licensee. The ALJ decisions and the number of employee concerns indicate the continuing need for licensee management to ensure that all personnel feel free to raise issues and understand that the issues will be responsibly addressed by licensee management.

2. Performance Rating

Performance Assessment - Category 2

3. Board Recommendations

The licensee should more thoroughly evaluate and follow up on corrective actions from self-identified deficiencies. Continued management attention to the reduction of human performance errors is needed. Management should foster an improved environment where personnel feel free to raise safety issues. Trending information should be fully utilized to upgrade performance across the board.



IV. SUPPORTING DATA AND SUMMARIES.

A. Licensee Activities

Unit 1

Palo Verde Unit 1 entered the assessment period in Mode 6 with fuel off-load in progress during the third refueling outage. The refueling outage ended on May 23, 1992. Unit 1 operated nominally at full power during the SALP period, with occasional brief power curtailments for maintenance and testing activities, except as follows:

On September 28, 1992, a reactor trip occurred after the main turbine tripped due to the actuation of a subsynchronous relay. The relay actuated after an AC soldering iron touched an energized DC alarm circuit. Unit 1 was restarted on October 1, 1992, and reached 100% power on October 4.

On December 8, 1992, a reactor trip occurred after the main turbine tripped due to the actuation of a relay following a grid perturbation. Following replacement of the faulty relay, Unit 1 was restarted on December 10, 1992, and reached 100% power on December 12.

On January 30, 1993, the reactor was manually tripped after the main turbine tripped due to a high moisture separator reheater drain tank level. The high level was caused by a faulty high level valve controller and an improper valve lineup for the normal level control valve. Following replacement of the faulty level controller and a system valve lineup, Unit 1 was restarted on January 31, 1993, and reached 100% power on February 2, 1993.

On May 16, 1993, the main electric generator was disconnected from the grid for repair of a hydrogen leak. The generator was reconnected to the grid on May 18, 1993.

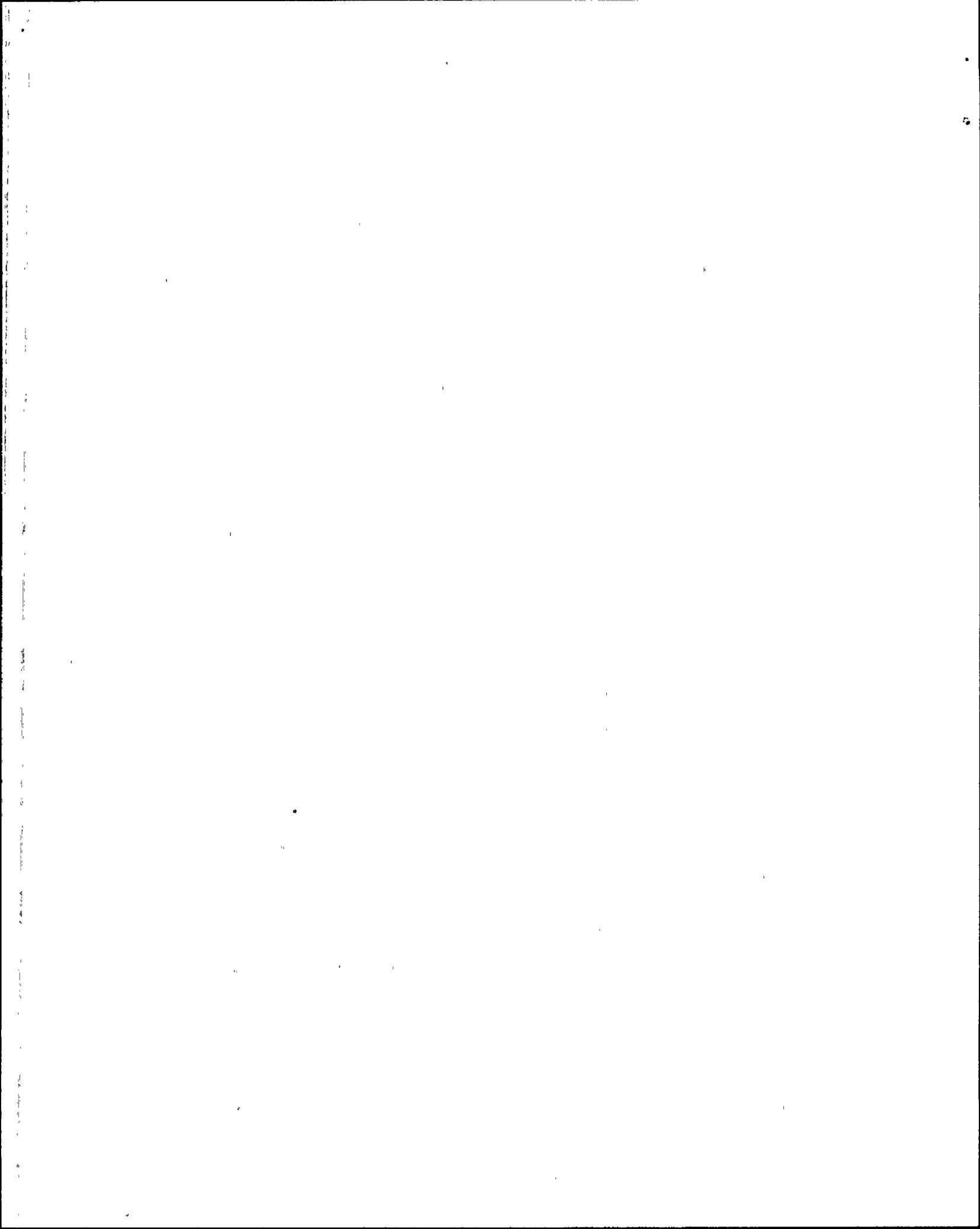
Palo Verde Unit 1 ended the assessment period operating at full power.

Unit 2

Palo Verde Unit 2 entered the assessment period at full power and operated nominally at full power for most of the SALP period, with occasional brief power curtailments for maintenance and testing activities, except as follows:

On March 23, 1992, the reactor tripped after electric power was lost to two reactor coolant pumps due to the failure of a startup transformer disconnect switch. Following repairs, Unit 2 was restarted on March 27, 1992, and reached 100% power on March 29.

On November 13, 1992, the reactor tripped after a motor generator providing electric power to the control rods was inadvertently deenergized. A Notice of Unusual Event was declared after the trip due



to safety injection and containment isolation actuation signals as a result of low pressurizer pressure. Unit 2 was restarted on November 15, 1992, and reached 100% power on November 17.

On March 14, 1993, the reactor tripped after a tube ruptured in the number 2 steam generator. An Alert was declared as a result of this event.

Palo Verde Unit 2 ended the assessment period in Mode 5 during the fourth refueling outage.

Unit 3

Palo Verde Unit 3 entered the assessment period at full power and operated nominally at full power for most of the SALP period, with occasional brief power curtailments for maintenance and testing activities, except as follows:

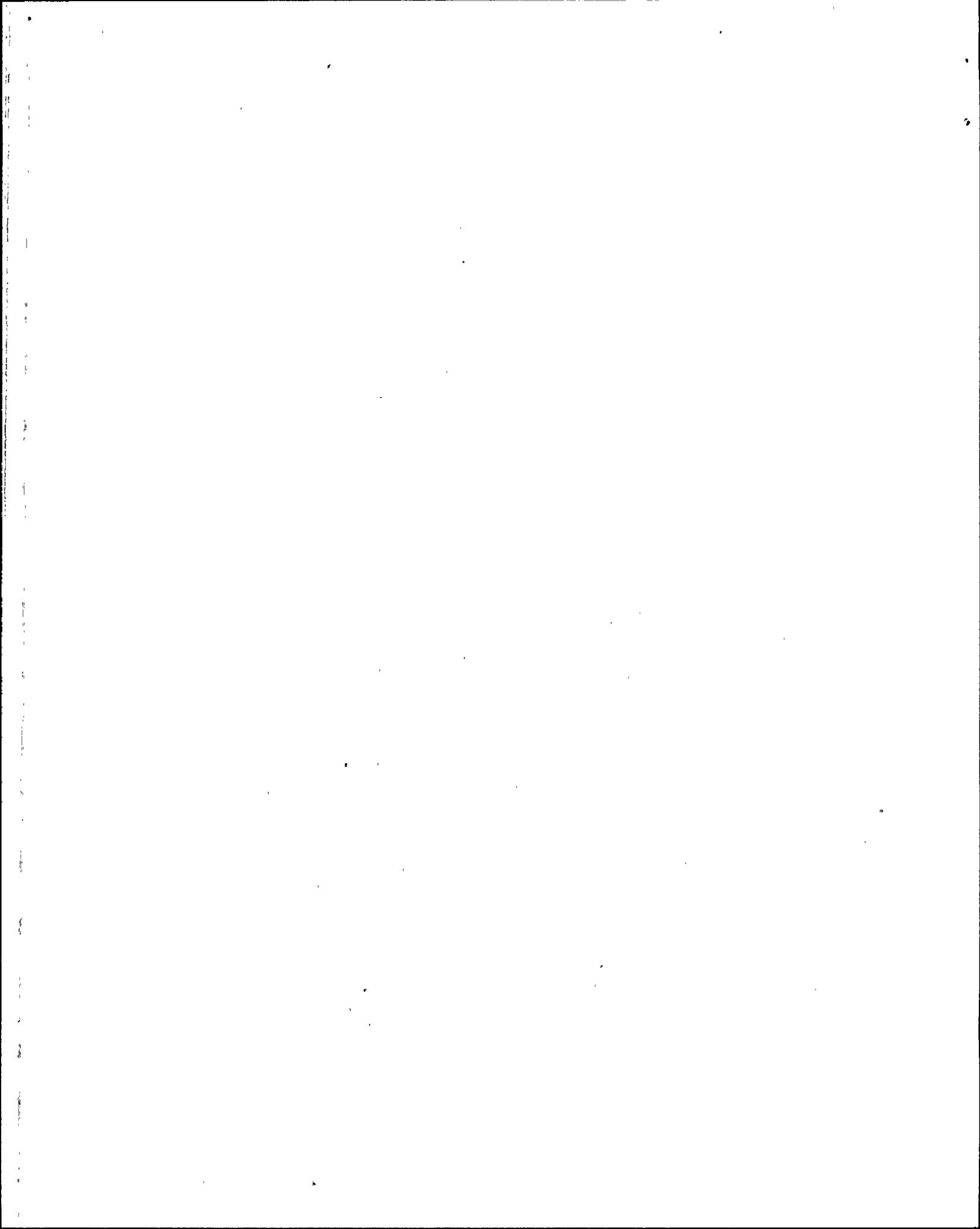
On May 4, 1992, an Alert was declared after the control room annunciator system was partially disabled due to a maintenance error. Reactor power was reduced and maintained at 70% during troubleshooting efforts. The Alert was terminated on May 6 after control room annunciators were returned to service. The Unit was shut down on May 7 to allow for additional annunciator troubleshooting. Unit 3 was restarted on May 14 and reached 100% power on May 19.

On June 3, 1992, a reactor cutback reduced power to 60% after a feedwater pump tripped on overspeed. Troubleshooting failed to identify the cause of the pump trip, and Unit 3 was returned to 100% power on June 6..

On August 19, 1992, the reactor was shut down to begin the third refueling outage. The refueling outage ended on November 25, 1992, and Unit 3 reached 100% power on November 30.

On February 4, 1993, the reactor tripped after the loss of a feedwater pump. A Notice of Unusual Event was declared after the trip due to safety injection and containment isolation actuation signals as a result of low pressurizer pressure. Troubleshooting failed to identify the cause of the pump trip, and Unit 3 was restarted on February 7. A reactor cutback to 60% power occurred on February 17 after the feedwater pump was manually tripped due to degraded performance. Troubleshooting revealed a faulty voltage regulator on one of the circuit cards for the feedwater pump controller. Following replacement of the circuit card and retest of the feedwater pump, Unit 3 was returned to 100% power on February 21.

On March 4, 1993, a reactor cutback reduced power to 55% after a feedwater pump was manually tripped in response to oscillating steam generator water level indications. Unit 3 was returned to 100% power on March 7. The cause of the temporary level oscillations was not determined.



On April 20, 1993, a reactor cutback reduced power to 47% after the main turbine tripped on high vibration. Reactor power was further reduced to approximately 10% for main turbine troubleshooting and replacement of a circuit card in the turbine supervisory instruments. Unit 3 was returned to 100% power on April 22.

Palo Verde Unit 3 ended the assessment period operating at full power.

B. Inspection Activities

Fifty-two routine and special inspections were conducted during this assessment period (March 1992 through May 1993), as listed below.

1. Inspection Data

Inspection reports: 92-02, 92-05, 92-09 through 92-12, 92-14 through 92-43, 93-02 through 93-05, 93-07, 93-09 through 93-11, 93-14 through 93-16, 93-18, 93-20 through 93-22, and 93-25. Five of the reports documented management meetings and three documented enforcement conferences.

2. Special Inspection Summary

Special inspections included the following:

92-12 April 6 - April 10, 1992: An evaluation of the new revision to the licensee's Emergency Operating Procedures

92-14 April 27 - June 5, 1992: A system-based instrumentation and control team inspection

92-16 April 4 - 10, 1992: Review of the failure of a Unit 3 reactor trip breaker to open

92-19 May 8 - 14, 1992: An Augmented Inspection Team following the loss of Unit 3 control room annunciators

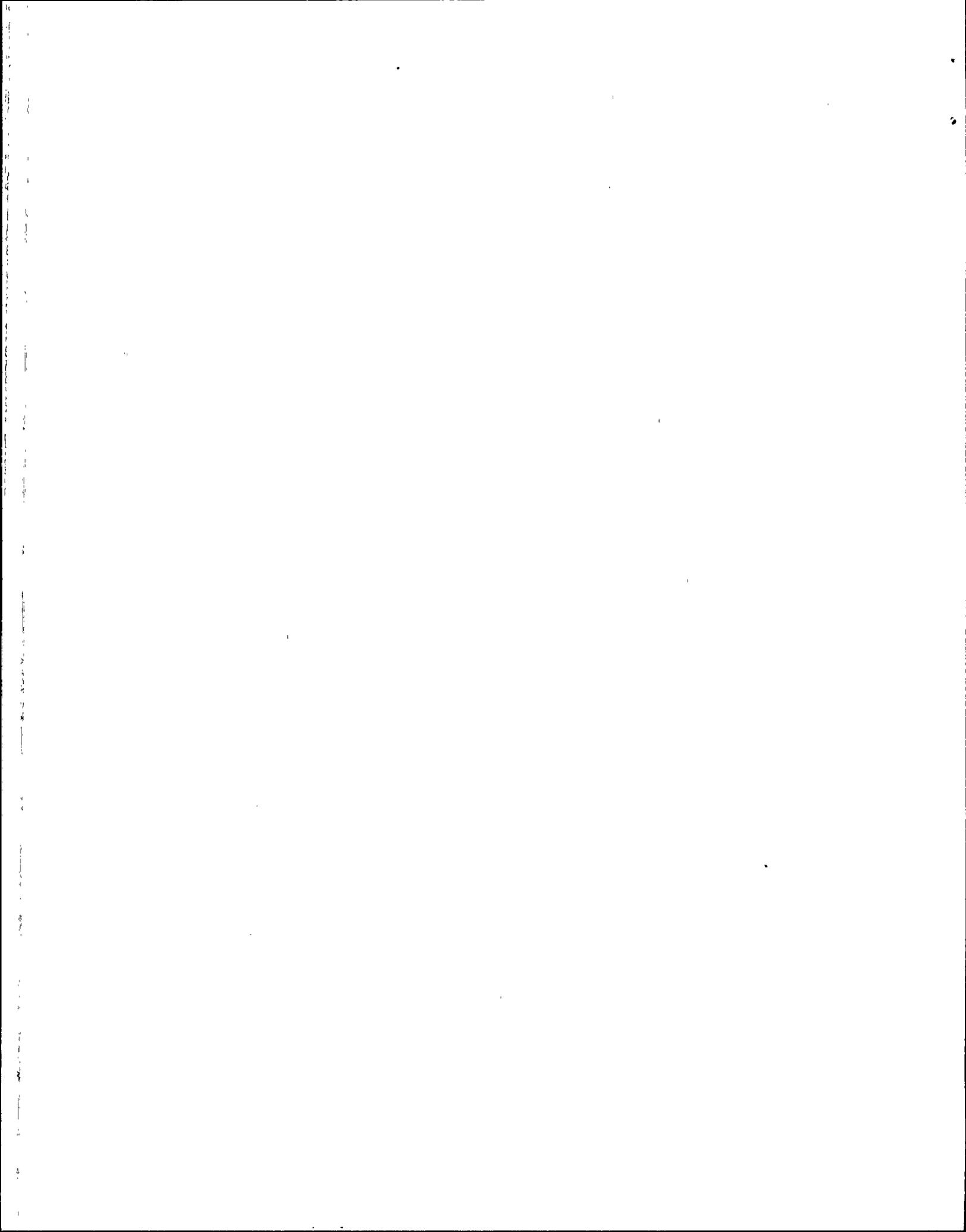
92-23 June 15 - 19, 1992: Review of a Unit 1 containment isolation check valve that was improperly assembled

92-32 October 13 - 23, 1992: Team inspection of the licensed operator requalification training program

92-33 September 14 - 18, 1992: Special inspection to gain a sense of perceptions and attitudes of workers with regard to their ability to raise safety issues

93-14 March 17 - 25, 1993: An Augmented Inspection Team following the Unit 2 steam generator tube rupture

93-22 May 11 - 14, 1993: Special inspection to follow up on issues identified in AIT report 93-14



C. Enforcement Activity

Inspections during this period identified 32 cited violations. Of these, 2 were Severity Level III, 28 were Severity Level IV and 2 were Severity Level V. In addition, one Severity Level II violation and one Severity Level III violation were cited based on discrimination cases before the Department of Labor. Three deviations were identified during this period.

D. Confirmatory Action Letters

None.

E. Licensee Event Reports

Unit 1 LERs

Unit 1 issued 20 LERs during this reporting period. The LERs were 92-001 through 92-017, and 93-001 through 93-003. LER 92-013 was voluntary.

Unit 2 LERs

Unit 2 issued 8 LERs during this reporting period. The LERs were 91-008, 92-001 through 92-006, and 93-001. LER 91-008 was voluntary.

Unit 3 LERs

Unit 3 issued 6 LERs during this reporting period. The LERs were 92-001 through 92-005 and 93-001.

