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OFFICE OF NUCLEAR REACTOR REGULATION

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Licensee: Southern California Edison Company

Facility Name: San Onofre Nuclear Generating Station, Units 2 and 3

Inspection at: San Onofre Nuclear Generating Station

Inspection Conducted: October 16-26, 1995 (Second Phase)

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EXECUTIVE SUMMARY

During the months of September and October of 1995, a team of eight inspectors from the NRC's Office of Nuclear Reactor Regulation conducted an integrated assessment of performance at the San Onofre Nuclear Generating Station, Units 2 and 3. The assessment was conducted in accordance with NRC Inspection Procedure 93808 "Integrated Performance Assessment Process." The purpose of the assessment was to assess performance in the areas of safety assessment/corrective action, operations, engineering, maintenance, and plant support for the period from September 1993 to October 1995. The assessment consisted of a preliminary, in-office review of documentation conducted during the period of September 11 through 22, 1995, and an onsite assessment of performance conducted during the period of October 16 through 26, 1995. The results of the team's preliminary, in-office review of documentation were contained in a report issued on October 2, 1995.

The overall results of this assessment will be used to focus future NRC inspection resources in areas that exhibited weak performance and reduce future NRC inspection resources in those areas that exhibited superior performance. The details of the team's findings are contained within the following assessment report and are presented on a Final Performance Assessment/Inspection Planning Tree which is attached as Appendix A to this report. The team's findings were also presented during a public exit meeting conducted on November 16, 1995. A copy of the presentation given at that meeting is attached as Appendix B to this report.

In summary, the team observed San Onofre to be a safe and a generally well operated facility. None of the team's individual findings indicated a major programmatic weakness in any of the five program areas. The team recommended that normal NRC inspection resources be implemented in the areas of safety assessment/corrective action, operations, and maintenance. Reduced NRC inspection resources were recommended in the areas of engineering and plant support.

Within the area of safety assessment/corrective action, the team identified that the licensee's corrective action systems have been effective at capturing equipment, design, and procedural deficiencies. Root cause analyses performed for equipment deficiencies and for performance issues were good. Particularly effective were those evaluations done by the Safety Engineering Group on operational performance. Reviews conducted by the Nuclear Oversight Division of industry issues were also found to be effective.

Weaknesses in the area of safety assessment/corrective action included the inappropriate classification of deficiencies on Station Problem Reports and the lack of procedural guidance for tracking Interdivisional Investigation Reports and for reporting the status of open Division Investigation Reports. The team also identified that human performance data had not been effectively integrated into the overall site wide trending done by the Nuclear Oversight Division. Surveillance audits were not proficient at identifying significant performance weaknesses. Also, quarterly assessments performed by the Nuclear Oversight Division did not consistently identify specific areas in need of management attention. Overall station response to programmatic issues such as those involving operational performance weaknesses has not always been comprehensive.

In the area of operations, performance during normal plant operations was good; however, there were continuing problems noted during outage periods with operator performance. Many operator performance issues appeared to be related to a lack of management reinforcement of high operating standards among the operators and to inadequate procedures. Events such as inadvertent entry into Technical Specification (TS) 3.0.3 caused by operators making one of the Unit 2 feedwater isolation valves inoperable, flow diversion from the reactor coolant system to the refueling water storage tank, and a TS oxygen violation were examples of weak safety focus by the operators during outage periods. Recent initiatives by management in the areas of communication, shift turnovers, pre-evolution briefings, control room access, and response to annunciators have resulted in some performance improvement. The second outage this year had fewer events and issues; however, performance during subsequent outage periods warrants careful monitoring to ensure that performance improvement initiatives have been fully effective.

In the area of engineering, overall performance was superior. Operability evaluations were performed well and management goals and priorities were properly communicated. Engineering self-assessments thoroughly evaluated identified problems, determined the root causes, and proposed appropriate corrective actions. Safety evaluations for plant modifications were performed thoroughly by appropriately trained engineers. The system engineering program was also effective. Effective programs have been established for barrier control, safety monitoring, steam generator tube integrity monitoring, instrument setpoint validation, and for real time display of plant data.

Weaknesses identified in engineering included an example where the torque switch setting for the auxiliary feedwater turbine trip and throttle valve did not appropriately account for the forces associated with re-latching the trip mechanism. Also, the licensee had not adequately resolved an issue associated with the capacity of the inverters for the shutdown cooling bypass valves.

In the area of maintenance, overall performance was generally adequate. The use of a safety monitor to calculate risk in scheduling equipment outages and the reliability centered maintenance program were both strengths within the maintenance program. The maintenance leadership observation program was effective and aided in providing supervisory oversight, problem identification, and corrective action tracking. Other positive aspects included the low threshold for identification of equipment deficiencies, the pre-programmed tagouts for all major components, and the proactive communications between maintenance, engineering, and operations. Overall plant material condition appeared about average for a plant of this vintage.

Weaknesses within the maintenance area included an instance where a poor maintenance practice contributed to the failure of an auxiliary feedwater turbine trip and throttle valve during a surveillance test. Also, formal maintenance self assessments have not sufficiently captured human performance data.

Overall performance in the plant support areas of radiological controls, security, and emergency preparedness was superior. Specific strengths included the establishment of effective training programs, the initiatives by health physics to reduce radiation exposure, the emergency planning staffing and facilities, the posting of radiation areas, aggressive self assessments, and good performance during emergency exercises. Minor weaknesses included an increase in security infractions and two chemistry incidents that occurred during the team's onsite assessment.

ASSESSMENT OBJECTIVES, SCOPE, AND METHODOLOGY

To improve the effectiveness in which the NRC focuses it resources at operating nuclear power plants, the Office of Nuclear Reactor Regulation (NRR) has developed an Integrated Performance Assessment Process (IPAP). This process, described in NRC Inspection Procedure 93808, is designed to identify programmatic and performance strengths and weaknesses in the areas of safety assessment/corrective action, operations, engineering, maintenance, and plant support.

This report documents the team's performance assessment of the San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 for the period from September of 1993 to October of 1995. The assessment team consisted of eight individuals from NRR, all of which whom had no normal oversight duties for the San Onofre site. The assessment was broken up into two phases; a preliminary documentation review performed in NRC headquarters, and a final performance based assessment which was conducted on-site.

The results of the team's preliminary assessment were documented in a report issued on October 2, 1995. Subsequent to issuance of that report, a two week on-site assessment of performance was performed. The results from the on-site assessment have been integrated with those of the preliminary assessment and are contained in this Final Assessment Report. Also contained within this report are recommendations for future NRC inspection focus. These recommendations are also depicted on a Final Performance Assessment/Inspection Planning Tree. The inspection recommendations are scaled to what would be normal NRC inspection effort at an average performing plant.

In performing its integration of results from the preliminary and on-site portions of the assessment, the team attempted to relate individual findings or issues to areas of perceived programmatic strengths or weaknesses. Also, an attempt was made to evaluate licensee performance to non-routine events such as those that might occur during postulated accident conditions. In all areas of the assessment, the team evaluated the effectiveness of the corrective action and performance assessment systems, as the effectiveness of these systems was seen as a major influence on overall organizational performance.

The final ratings and inspection recommendations take into account performance during the entire assessment period but are heavily weighted towards recent performance as the most effective use of NRC resources would be to focus on areas where performance weaknesses still exist or have not completely been resolved.

1.0 SAFETY ASSESSMENT AND CORRECTIVE ACTION

Overall, performance in the area of safety assessment/corrective action was determined to be adequate. The team identified that the licensee's corrective action systems have been effective at capturing equipment, design, and procedural deficiencies. Root cause analyses performed for equipment deficiencies and for performance issues were also identified as being a strength. Particularly effective were those evaluations done by the Nuclear Oversight Division's (NOD's) Safety Engineering Group on operational performance. The corrective action request (CAR) process was found to be an effective means for communicating programmatic weaknesses and included good root cause analysis, tracking, and resolution reviews. Also, reviews conducted by the NOD of industry issues were found to be effective.

Weaknesses were identified by the team with the inappropriate classification of deficiencies as site problem reports (SPRs) and the lack of procedural guidance for tracking interdivisional investigation reports (IDIRs) and for reporting the status of open division investigation reports (DIRs). The team also identified an absence of human performance data (other than that taken from event analysis) from the overall site wide trending done by NOD. Surveillance audits have not identified significant performance weaknesses and NOD quarterly assessments have not consistently identified specific areas in need of management attention. Also, overall station response to programmatic issues such as those involving operational performance weaknesses has not always been fully effective.

1.1 Problem Identification

The preliminary assessment report indicated that the quality oversight groups had been effective at identifying a wide range of performance concerns. Most effective were those special assessments conducted by the Safety Engineering Group (SEG). However, at lower levels within the corrective action system, concern was raised over the complexity of the many site-wide corrective action documents. In a few instances, a lack of thoroughness and inappropriate initial categorization of the corrective action was also identified; however, this problem did not appear to be pervasive. Overall performance in this area was therefore rated as indeterminate pending on-site assessment of the effectiveness of lower level problem identification systems.

During the site visit, the team determined that the licensee has separate problem identification systems for dealing with either problems related to equipment, human performance, or programmatic deficiencies. The non-conformance report (NCR) program is used for the control and use of nonconforming material, parts, or components, to prevent their inadvertent use. The NCR program also provides a method of identifying plant design deficiencies and conducting additional root cause evaluations. The SPR program is used for identifying potential plant improvements and for soliciting engineering evaluations and correcting drawing discrepancies.

The DIR process is used to document human performance, or organizational and programmatic deficiencies. The team noted that procedure S0123-XV-50.39.1, "Division Investigation Reports," Revision 1 stipulated that each division is responsible to implement the investigation report program. For example, the Operations Division uses Operations Division Experience Reports (ODERs), the Maintenance Division has Maintenance Division Investigation Reports (MDIRs), the Engineering Division has Technical Division Investigation Reports (TDIRs), and the Radiation Division has Health Physics Experience Reports (HPERs). Also, issues affecting more than one division are identified through another process called interdivisional investigation reports (IDIRs). Other less formal programs also exist such as the operations program for identifying near misses and challenges.

Based on a sample review of completed corrective action documents such as NCRs, SPRs, and DIRs, and interviews with SONGS staff, the team identified that significant equipment issues were being appropriately identified via one aspect or another of the licensee's corrective action systems. A review of NCRs issued for the last one year indicated that approximately 1500 NCRs were issued by the licensee's various organizations. During discussions with the licensee's staff and management, the team noted that SONGS emphasizes that an NCR should be written for any deficiencies associated with material, parts or components. This policy keeps the threshold for issuing NCRs low.

The licensee stated that they have developed plans to implement an easier process for problem identification, and that the new system will provide for a single process for all problems identified regardless of which area it applies. The team noted that the licensee is still going to keep the different corrective action programs mentioned above under the new Action Request process. The team did not review this program because it was neither finalized nor implemented.

Misuse of SPRs for reporting plant deficiencies

The team noted that the licensee's procedure SO123-XV-43, "Site Problem Report," Revision 1, Section 1.2 stated that the SPR process is to be used for documenting improvement initiatives and is not to be used to document and correct any deficiencies. However, from a sample review of nine, the team identified two examples where apparent plant deficiencies were identified on SPRs. Consequently, no root-cause, 10 CFR 50.59 review, operability review, or reportability evaluation were performed.

In the one example, SPR No. 940210 was written to correct a design deficiency in the safe shutdown/station blackout emergency light installation in Battery and DC Distribution Room 310 A. Specifically, the emergency lighting unit had its relay power supply connected downstream of the normal lighting wall-mounted switch instead of upstream. The switch is normally turned off when the room is unoccupied which had been causing the emergency light batteries to drain during the period when the power was switched off.

In a second example, instances of spurious actuations of the fire protection pre-action deluge had occurred as a result of the infrared fire detectors sensing flashing lights in the diesel generator and auxiliary feedwater buildings. This deficiency was identified and corrected through SPR 940278. The reason for the spurious actuation was the incorrect design of a portion of the fire protection system. Specifically, the actuation delay on the four detectors in each building was 3 seconds for two detectors and 30 seconds for the other two. The licensee corrected this condition by changing the actuation time delay from 3 seconds to 30 seconds for all detectors.

The team was concerned because the licensee's review process, including the plant modification review committee, did not identify or question the adequacy of using the SPR process for identifying and correcting the above deficiencies. The team noted that a CAR (No. 1407) had been issued in 1992 by QA to resolve similar program implementation deficiencies with the SPR process. As a result of this CAR, the Plant Modification Review Committee was organized. This group was tasked with ensuring the effectiveness of the SPR process with one of the tasks being to ensure that the SPR process is not used for resolving plant deficiencies.

QA Surveillances

The team reviewed twenty quality assurance surveillance audits performed in 1995. The findings identified in these audits were minor and compliance oriented in nature. The audit reports documented that timely corrective actions were taken by the licensee to correct the weaknesses. The team noted that the licensee's surveillance audits were not successful in identifying programmatic issues such as those related to operational performance, incorrect usage of the SPR process, maintenance and test equipment (M&TE) usage, or switchyard control problems which were subsequently identified by either other aspects of the licensee's assessment programs or by the NRC. The team concluded that the effectiveness of the QA surveillance audits could be improved by focusing on broader programmatic performance.

Conclusion

In summary, the corrective action systems were determined to be effective at capturing equipment, design, and procedural deficiencies; but it appeared that plant deficiencies are sometimes mis-characterized as improvement initiatives, and as such, do not receive root-cause and operability evaluations. Also, QA surveillances were not effective at pro-actively identifying programmatic issues. Overall, based on the preliminary assessment and the subsequent onsite review, the team observed mixed performance in the area of Problem Identification indicating a need for normal inspection activities.

The team recommends that future inspection effort be focused on the review of the licensee's new proposed single form problem identification process (Action Request Process), the usage of the SPR program, and the effectiveness of QA surveillance audits.

1.2 Problem Analysis and Evaluation

During the in-office review, the team concluded that NOD's performance in this area was superior. The assessment in the preliminary report characterized the root cause evaluations conducted by the SEG as examples of strong performance in the self-assessment area. Trending analyses, performed by the SEG, which identified if individual problems were related to common organizational causes, were also identified as a strength. The Quarterly Station Performance

Reports prepared by QA were considered to be a strength, although data integration and analysis was not always apparent.

While on-site, the team conducted a review of the aggregate functions that NOD performed in the areas of problem analysis and evaluation for the site. This NOD oversight function was primarily performed by the SEG and QA groups within NOD. The team reviewed root cause evaluations and safety engineering assessments issued by SEG; and quarterly station performance reports, corrective action requests, problem review reports, and field corrected errors issued by QA. The team also reviewed the licensee's site-wide trending programs.

The team determined that the SEG had consistently conducted insightful problem analyses and evaluations in the form of safety assessments and root cause evaluations; all of which appeared to accurately identify the root cause(s) of issues. For instance, over the last two years, the SEG has compiled and analyzed all of the corrective action documents, NOVs, LERs, and NRC inspection reports in the divisional areas. As a result, recommendations were made in each deficient area. In the area of operations, for instance, the SEG issued two safety assessment evaluations (SEA 95-05 & SEA 94-008) and one root cause analysis (RCE 95-05).

Another strength within the NOD organization was the CAR process which was seen to have effectively identified degraded conditions and their corresponding root causes. The QA organization issued CARs to line organizations where significant problems had been identified. For example, CAR-004-95, CAR-011-94, and CAR-013-94 were generated in the operations area. In each case, the respective line organization was required to submit corrective actions for approval. While on site, the team observed a meeting of the licensee's Effectiveness Review Committee (ERC) which had convened to discuss the effectiveness of the proposed corrective actions submitted by operations for CAR-004-95. The committee was observed to have appropriately challenged the proposed corrective actions.

Tracking of Corrective Actions

During the assessment, the team identified weaknesses in the licensee's systems for tracking corrective actions. One example was the tracking of commitments made on IDIRs. Although the licensee had issued specific guidance for tracking of DIRs, the tracking of IDIRs was not governed by a procedure. The team noted that in the case of IDIRs, a consistent method for tracking corrective actions was not established. When operations was the lead organization, they tracked the corrective actions in their own database for all Divisions involved. When maintenance or engineering were the lead organizations, they tracked only corrective actions assigned to themselves and put all corrective action commitments into the Nonregulatory Action Tracking System (NATS), such that NATS would track and follow-up on the other Divisions. This informal, computerized tracking and notification process is centralized on the NATS computer system. A staff member of the Regulatory

Compliance Group E-Mailed information to the owner of the corrective actions regarding due and overdue corrective actions. Although this informal method of tracking corrective actions was seen as a weakness, no specific examples of uncorrected deficiencies were identified by the team.

Concerns with the tracking of corrective actions were also identified by the licensee's QA organization in CAR-007-95 - "Ineffective Implementation of Divisional Investigation Report Corrective Actions." A QA assessment of the control and implementation of actions resulting from DIRs had revealed a high rate of discrepancy in the control exercised by site divisions over DIR action items. Of the 45 DIR actions reviewed, 67% (30) were closed or tracked such that the status was clear and current. The remaining 33% (15) had some level of ambiguity with regards to tracking, implementation, or closure.

The team also identified that an annual effectiveness review required by the DIR procedure (which included tracking and the IDIR process) was not being performed. The licensee had only reviewed a narrow aspect of the DIR process, concerning the incorporation of industry and operating experience when conducting a root cause evaluation.

Trending Programs

Trending of performance data at San Onofre was conducted by individual line organizations and by the NOD. Separate performance indicators were used by the individual line organizations to trend the respective division's performance. The data used to generate the performance indicators was primarily event oriented and did not include human performance observed during day-to-day work activities. Nevertheless, some line organizations utilized separate programs to monitor and retain this type of human performance data. Examples included the Maintenance Leadership Program and the Operations Monitoring Program. In engineering, equipment problems were separately tracked and trended via programs used to satisfy the maintenance rule. Overall, the effectiveness of the trending program was determined to be adequate, but limited by the lack of human performance data in the overall site trending done by NOD.

NOD Performance Assessment

To capture the site performance from a broader perspective, NOD used; (1) Focus Reports, issued by SEG, (2) Organizational Common Cause Analysis Trending and Monitoring Program Reports, issued by SEG, and (3) Quarterly Station Reports, issued by QA, to trend the performance of line organizations. The SEG focus reports identified areas within the line organizations that were in need of improved performance; however, the event driven nature of the trended data hindered the licensee's ability to pro-actively identify performance weaknesses. Also, although Quarterly Station Reports provided a summary of performance for all divisions, the summaries were primarily in the form of annunciator windows and often lacked evidence of sufficient analysis and data integration. The reports also were not consistent at identifying specific performance weaknesses for management focus. The team concluded that senior licensee management received performance data from a combination of the

NOD reports and the performance reports issued by the individual line organizations. The team could not determine what specific actions were taken by senior licensee management with regards to the performance assessment data.

Conclusion

The team concluded that NOD has performed a strong oversight function for the problem analysis and evaluation of site-wide problems. However, human performance data has not been given appropriate visibility in the licensee's trending and performance assessment systems. Also, the team was unable to identify instances where the licensee had converted NOD performance data into specific management initiatives. Overall, the team observed mixed performance in the area of problem analyses and evaluation indicating a need for normal inspection activities.

The team recommends that future inspection effort focus on the licensee's effectiveness at capturing, analyzing, and converting site wide performance data into distinct action items for areas in need of performance improvement. Some effort should also be directed at ensuring that the corrective action tracking systems ensure that assigned corrective actions are carried out.

1.3 Problem Resolution

During the in-office review, the team identified the licensee's performance in resolving specific and programmatic issues as indeterminate. The preliminary assessment noted instances where corrective actions were too narrow in scope to prevent recurrence of similar problems. Furthermore, reviews to ensure the effectiveness of the corrective action, apparently, had not consistently been performed.

While on-site, the team reviewed root cause evaluations, safety assessments, corrective action requests, operations challenges, operations near misses, operation division event reports (ODERs), IDIRs, maintenance division event reports (MDERs), non-conformance reports (NCRs), SPRs, backlog of corrective action documents, and industry operating experience reviews.

Organizational Response To Programmatic Issues

The team identified that the licensee was not always successful in effecting timely resolution to large-scale, programmatic issues, such as those concerning operator performance. Although the NOD responded to numerous operational events by issuing a series of higher level corrective action documents, line management's actions to respond to these issues were not always effective.

Figure 1 depicts 15 operational events that occurred over a two year time period from October 1993 to September 1995. In response to these events, the Nuclear Oversight Division's Safety Engineering Group issued two Safety Engineering Assessments and one Root Cause Evaluation. The Quality Assurance Group also issued four CARs. Problems with operator performance were also identified in CAR-013-94 - Operations Degraded Performance, issued in August 1994. These corrective action requests, evaluations, and assessments provided

OPERATING PERFORMANCE HISTORY

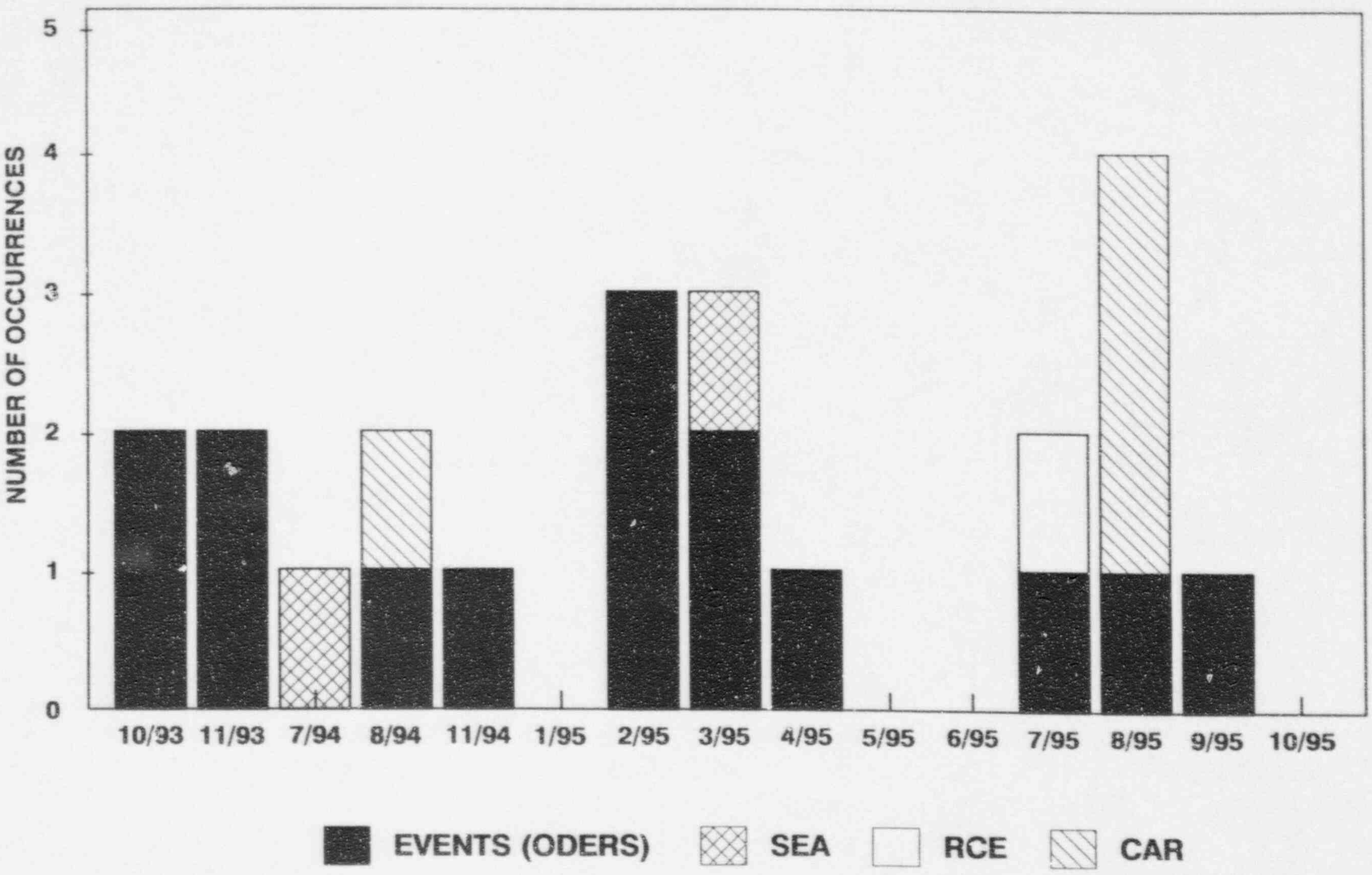


FIGURE 1

good descriptions of the problems and contained good analyses of the relevant data. Response to these documents by line management, however, was not sufficiently comprehensive to prevent further escalation of the operations performance problem. Not until operator performance issues resulted in numerous events during the outages conducted earlier this year, did line management take extensive, focused corrective actions in the operations area.

While on-site, the team observed a meeting of an Effectiveness Review Committee (ERC) brought together to review the Operations Division's response to CAR-004-95 - Operations Division Performance. In the final stages of the CAR process, the ERC reached a consensus that there was uncertainty regarding the adequacy of the corrective actions proposed by the Operations Division to resolve the reoccurring problems identified in the CAR. The ERC decided to hold the CAR open, pending implementation of performance based observations, a special assessment, and the issuance of a quarterly QA surveillance/report that addressed the effectiveness of the proposed corrective actions. The team found the ERC actions to be challenging and appropriate.

Organizational Response to specific NOD findings

Line organizational responses to specific issues raised by NOD via SEG assessments and QA findings were also not always effective. For example, on August 22, 1995, the licensee experienced an event involving air binding during the start of a LPSI pump. A similar problem had previously occurred on March 9, 1995 with the inadequate venting of the Emergency Core Cooling System (ECCS) suction header. The actions taken by the Operations Division had failed to prevent re-occurrence of this problem. NOD recognized the repetitive occurrence and issued CAR-011-95 -"Ineffective Corrective Action Scope," on August 24, 1995. The Operations Department's response to this CAR was considered deficient by QA as operations had failed to consider applicability to other systems that were vented. When this concern was brought to their attention, operations amended their submittal which was accepted by QA.

Line organizational response to specific issues identified on SPRs, NCRs, IDIRs, etc., appeared to be adequate. A review of a sample of closed-out NCRs, IDIRs and SPRs indicated that, in general, the corrective actions were appropriate and timely. The team also noted that QA had conducted several field observations to verify the adequacy of corrective actions taken by the licensee for issues such as those concerning deficiencies in the licensee's program for measurement and test equipment (M&TE) control. During QA and QC observation activities in the field (containment high radiation loop calibration and replacement of EQ solenoid valve), the team found the auditors to be knowledgeable and focusing on performance as well as procedure adherence issues. The team noted that during field observations, the QA and QC auditors were verifying the correct usage of M&TE tools. No deficiencies were identified by the team with the use of M&TE during the assessment.

Status of Corrective Action Backlog

The licensee has made significant progress in reducing the backlog of NCRs and SPRs. A continued decreasing trend was noted in the backlog of open items.

The licensee has established a goal of less than 250 open NCRs and less than 125 open SPRs. However, the team noted that the actual backlogs were 630 and 266 as of September of 1995 for NCRs and SPRs, respectively. Also, approximately 10 percent of the open NCRs were not dispositioned within 14 days as required by the NCR procedure. The team noted that a report was issued to the division managers requesting justifications for not meeting the required disposition dates. The backlog of other corrective action documents were found to be minimal except for MDERs. Though the backlog of MDERs appeared to be high (out of 125 issued in 1995, 52 were still open and 22 were overdue), management was aware of this problem and was addressing the backlog.

Operating Experience Reviews

Reviews of industry issues performed by the NOD's Independent Safety Engineering Group (ISEG) were thorough and well documented. The ISEG collected and disseminated industry operational experience information and ensured resolution of identified concerns. The group appeared to be fully capable, and was staffed with qualified engineers. The team reviewed seven NRC information notices and three part 21 notifications and determined that the licensee's reviews were well documented, thorough, and performed in a timely manner. An audit was performed every year by an industry peer group to assess the effectiveness of the Operating Experience Program. The recommendations were determined to be tracked and resolved adequately.

Conclusion

Overall, NOD has done an effective job of responding to programmatic issues such as the problems noted with operational performance. Management's response to the programmatic issues raised by NOD have not, however, always been effective. Line organization response to lower level issues was generally adequate. Reviews of industry issues performed by the NOD's Independent Safety Engineering Group (ISEG) were thorough and well documented. The backlog of corrective action documents appeared to be adequately managed.

The team determined the licensee's performance in the area of problem resolution to be adequate and recommends normal inspection effort be implemented in this area. The inspection effort should focus on ensuring the effectiveness of line management corrective actions to programmatic weaknesses.

2.0 OPERATIONS

Overall, performance in the operations area was considered to be adequate. Performance during normal plant operations appeared to be generally good; however, there were continuing problems noted during outage periods in the areas of operator performance and with the usage of procedures. Although these problems had been identified since early 1994, the licensee's problem resolution efforts were not sufficiently focused to avoid numerous challenges to plant safety barriers during the recent dual unit outages. Many operator performance issues appeared to be related to a lack of management reinforcement of high operating standards among the operators. Recent initiatives in the areas of communication, shift turnovers, pre-evolution briefings, control room access, and response to annunciators have apparently resulted in some performance improvement. It was noted that the second outage this year had fewer events and issues; however, this improved performance was considered to be normal for a subsequent unit outage. Consequently, the degree to which operator performance improvements could be attributed to the corrective actions taken was difficult to quantify.

2.1 Safety Focus and Management Involvement

During the in-office review, the team concluded that safety focus and management involvement in the operations area was weak and increased inspection was warranted. Inspection reports indicated that safety focus of the on-shift operators needed improvement and that increased management involvement to decrease the rate of operator errors appeared warranted. Events such as inadvertent entry into Technical Specification (TS) 3.0.3 caused by operators making one of the Unit 2 feedwater isolation valves inoperable, flow diversion from the reactor coolant system to the refueling water storage tank, and a TS oxygen concentration violation were considered examples of weak safety focus displayed by the operators during the outage period. Also, the licensee's internal self-assessments of operator performance indicated operator command and control to be an area which needed improvement. In contrast, operator performance during plant operation appeared to be good and relatively event free.

The team observations conducted during the onsite phase of the assessment revealed strong management presence in the control room. As part of the corrective actions to address the various operator performance issues during the Unit 2 1995 refueling outage, the Shift Superintendent (SS) was now required to spend a majority of his time in the control room. The SS provided immediate feedback to the control room supervisor (CRS) when management expectations were not met by the operators on-shift. The team observed two other shifts and found that the SS also actively oversaw activities during these two shifts.

The team also observed thorough pre-evolutionary briefs, referred to as "tailboards," for several planned surveillance activities. In these briefs, the operators placed emphasis on ensuring that all precautions and expected system responses were well understood by individuals involved in the activities. Additionally, there were good communications between the control room operators and the SS on the status of evolutions and surveillances which were in progress. There was indication that the site management had placed further emphasis on ensuring that operators conducted thorough tailboards and effective two-way communications. Discussion with the operations management indicated that emphasis on good operator fundamentals (i.e., knowledge, skills, and abilities) was intended to improve the operator performance during more challenging operational periods such as during refueling outages.

Based on discussions with operations department management, the team learned that the licensee had attributed much of the observed performance weaknesses to a lack of operator experience. Management stated that a personnel turnover rate of about 17 percent through the early 1990s led to a situation where some less experienced personnel were in key positions. The licensee further stated that operator staffing had stabilized with little or no attrition in the last several years and that the overall experience level of the operators on-shift should increase.

The assessment team agreed that some of the performance issues could be attributed to a lack of operator experience, but the team concluded that the operator performance issues had existed for some time, and that these issues went beyond the inexperience level of some of the operators. Based on the team's review of other licensee assessments such as "Assessment of Operations Division Events for Trends and Common Causes, SEA 94-008," and "Safety Engineering Command and Control Evaluation, SEA 95-05," many operator performance issues appeared to be related to a lack of management reinforcement of high operating standards among the operators. It appeared to the team that appropriate management focus was not given to the operator performance issues until the poor operator performance caused several events during the Unit 2 1995 outage.

In addition, the team identified some internal disagreement concerning performance of the operations department during the last several years. Operations management's position was that performance actually improved during the 1995 outages when compared to the last set of outages in 1993. Senior licensee management did not share that opinion and believed that the operator performance had declined. The team attributed this disagreement to ineffective communication and was concerned that without a uniform understanding of operational performance, efforts to address performance weaknesses could be misdirected.

The team concluded that continued management focus will be necessary during outage periods to ensure that good operating practices will continue to be demonstrated by the operators.

Conclusion

Overall, performance in the area of safety focus was determined to be mixed. The team recommends that normal inspection activity be implemented in this area. Inspection efforts should focus on ensuring that management efforts have resulted in the demonstration of high operating standards by the operators. Inspections should also ensure that management expectations regarding performance have been clearly communicated and are supported throughout the organization.

2.2 Problem Identification and Resolution

During the in-office review, the team concluded that the problem identification and resolution area was indeterminate. Although it appeared that the significant problems in the operations area were being identified, inspection reports indicated that the operators were not always identifying less significant equipment deficiencies. Also the team could not determine the effectiveness of the operations department's corrective actions to the identified performance weaknesses.

During the on-site phase of the assessment, the team did not identify any deficiencies in the control room which were not already identified by the licensee. Walkdown of the control room panels indicated few problems with the control board indicators and all equipment controllers were in automatic. Likewise, no significant material deficiency items were identified during plant tours of the auxiliary or the turbine buildings.

Operations initiated the "Near Miss (NM)" program in 1992 to identify those operational difficulties which did not lead to plant transients. In late 1994, they initiated the "Challenges," program to identify even less significant operational issues. These programs appeared to be an attempt to become more proactive in addressing operational problems by lowering the threshold for problem identification. However, the team noted that the number of operational precursor events identified through the NM and Challenges programs was limited, which indicated to the team that the problem identification program was primarily event-driven. Additionally, both of these programs still were informal in that the operations department had not developed procedural guidance for implementation of the processes.

The team also noted that the number of issues identified in the NM and Challenge processes were low when compared to the number of operational issues and events. Generally, the team concluded that if all of the issues were reported per the program expectations there would have been a higher number of low level operational issues. For example, during discussions with NOD, the team identified an event in which a deficiency (such as a Near Miss or a Challenge) was not written. During the 1995 Unit 2 outage, the operators deadheaded the high pressure safety injection pump while performing a surveillance on a check valve. The procedure apparently was inadequate in that it was the fourth attempt to perform this surveillance and the procedure did not provide the correct flow path alignment. Although this problem did not cause a significant operational event, it is an issue that the team considered appropriate for initiation of a NM or a Challenge. This issue is also discussed in section 2.4 of this report. The team concluded that the problem identification process used by the operations department was adequate, but that improvements could be made to enhance the program's implementation.

The team also reviewed a sample of ODERs and NMs and found that the majority of the corrective actions taken to address deficiencies identified in the ODERs, and NMs were adequate. The only example of an ineffective resolution to an ODER involved the actions taken in response to a Unit 2 event (ODER 2-95-12) regarding air binding of a low pressure injection pump. The correction actions were too limited in scope and did not prevent a similar event in Unit 3 (ODER 3-95-26). Consequently, the operators air bound the Unit 3 low pressure safety injection pump on August 22, 1995.

Although the corrective actions taken to address many of the specific problems identified in the ODERs and NMs were adequate, the team found that the operations management's efforts were not successful at resolving the broader scale programmatic issues associated with operator performance prior to the beginning of the Unit 2 outage in 1995. Data obtained by the operations department using their problem identification system and data contained in reports issued by the NOD indicated that operator performance needed improvement since early 1994. Specifically, the NOD's conclusions, documented in a report (issued July 1994) entitled "Assessment of Operations Division Events For Trends and Common Cause (SEA 94-008)," determined that improvements were needed to address: operator task knowledge weaknesses, good operating practice weaknesses, procedural weaknesses, and perceived management pressure to rapidly complete tasks. A review of the corrective actions taken in response to this report indicated that the corrective actions were not sufficiently comprehensive to resolve the issues. Not until numerous operator related events occurred during the Unit 2 outage, did operations department management start to take comprehensive corrective actions to address some of these above problems.

Conclusion

Normal inspection effort is recommended in the area of problem identification and increased inspection effort is recommended in the area of problem resolution. Inspections should be focused on reviewing the utilization of the Near Miss and Challenges programs. Increased inspection in the area of problem resolution should focus on ensuring that operations management continues to monitor overall performance and takes aggressive corrective actions to identified performance weaknesses to prevent similar operator events.

2.3 Quality of Operations

The preliminary assessment noted that overall operator performance appeared to be mixed. The reports indicated that during normal operations, performance was relatively good and during outage periods, performance was weak. The preliminary report identified concerns in the areas of shift turnovers, knowledge of plant conditions, command and control, procedure adherence, operator performance during outages and the control of work activities. Based on the number and type of negative examples, the performance in this block was initially considered to be less than adequate.

Inspection report examples included instances of weak operator skills and knowledge such as an event where an operator opened the shutdown cooling (SDC) system minimum flow valve without ensuring that the reactor coolant system (RCS) loop isolation valves were closed. This act resulted in a flow diversion event and a loss of 670 gallons of water from the RCS to the reactor water storage tank (RWST). Additional examples, from inspection reports and licensee records, included: twice securing the main turbine lube oil pumps while the turbine was on the turning gear; inappropriately energizing the pressurizer backup heaters while shutdown; soft seating the main feedwater isolation valves and technically rendering them inoperable; improperly venting a LPSI pump and subsequently making three failed attempts to start the pump as it became air bound each time; racking in all three HPSI pump breakers contrary to Technical Specifications (TS); and failure to recognize an applicable TS action statement when an ECCS room cooler was taken out of service.

Inspection report examples also included: instances of weak operator performance such as air binding the LPSI pump during three attempts to start it; having fuel handling problems and not stopping and promptly notifying the control room; running the HPSI pump for two hours without cooling water (especially after having damaged two HPSI pumps during the last SALP period); and spilling boric acid as a result of failing to identify that removing a common relief valve would affect both boric acid pumps. There were additional examples that included: inadequate prestart checks on a motor that subsequently led to motor damage; not ensuring that RCS oxygen concentration met TS requirements prior to continuing RCS heatup; operating the wrong train isolation valve for the CCW heat exchanger; and authorizing a partial clearance that subsequently led to leakage from the SDC system to the containment sump.

While on site, the team discussed in detail the specific issues noted in the preliminary report, with operations management, in order to clarify and quantify specific items listed in the report. The discussions gave the team a better understanding of the issues which in a few instances lessened the team's concerns; however the number of overall events was high.

Deficiency Reporting System Review

During the present SALP period, NRC inspection reports have documented a number of operational performance issues. In order to obtain an overall perspective and to gain insights regarding recent performance, the team performed a detailed review of the various operations department deficiency reporting systems. Based on the docketed review and on-site review of deficiency reporting systems, the team concluded that there were two primary areas of operational weakness; operator skills and knowledge and implementation of skills and knowledge.

In addition, NOD noted during the performance of SEA 95-05 that corrective actions were warranted to address concerns with basic operator fundamentals. Interviews with the NOD auditors indicated that improvements were warranted in operator problem solving techniques, reading electrical schematics (specifically the functioning of relays and contacts), system venting requirements, the understanding and usage of pump curves, and basic system knowledge. The licensee was in the process of evaluating long term actions to improve basic operator skills and knowledge during the team's site assessment.

Overall, the data contained in the licensee deficiency reporting systems seemed to confirm the major issues identified in the preliminary assessment. The data also indicated that the performance appeared to have improved during the subsequent Unit 3 outage and that performance was relatively good during recent power operations.

On-Site Observations

While on-site, the team observed shift turnovers, control room and field communications, responses to annunciators, procedure usage and adherence, surveillance testing, operator rounds and pre-evolution briefings. The team did not identify any new or recurring issues in these areas and based on the limited number of observations, all of these areas were determined to be adequate. However, performance during non-routine (outage) periods will require continued attention until the initiatives taken to improve operations performance can be validated as being effective.

Notwithstanding the above, the team did make some observations concerning the conduct of operations in the control room. The first two observations were considered to be related in that they both indicated a lack of monitoring of the control boards.

- The team noted that the control room operators rarely performed control board walk downs, which appeared to be related to the control room operator's (CO's) extensive involvement with phone and radio communications, paperwork, and briefings. This was seen to negate the usefulness of marking all the control board instruments with an erasable marker at the beginning of the shift.

- The team noted, during a failure of the channel "D" nuclear instrument (NI), that the CO and the auxiliary CO (ACO) were involved with the related abnormal procedure and the control room supervisor (CRS) and the shift superintendent (SS) were involved with monitoring the CO's and ACO's activities. It did not appear that anyone continued to monitor the rest of the unit's control boards for the duration of the event. Everyone became focused on the NI failure and recovery.

- The team also noted that two way radio communications were sometimes garbled and the control room was often unable to contact the plant equipment operator without using the paging system. Interviews indicated that the difficulties were the result of some radio system repeater problems. The team did not consider the extent of the repeater problems at this site to be unusually high.

Conclusion

Overall performance in the area of quality of operations was considered to be mixed. Although during normal operations performance was generally good, the quality of operations during the recent dual unit outages was lacking. As a result, operation's management initiated numerous short-term corrective actions and other long term actions were being evaluated. The actions implemented to date appear to have addressed the majority of the performance issues; however, the team was unable to assess the overall effectiveness of the corrective actions related to outage performance problems. The licensee has not yet completed its evaluation of corrective actions to address the operator knowledge weaknesses. Further review during the next refueling outage and/or during future forced outages will be necessary in order to adequately evaluate the licensee's long term corrective actions.

The team recommends that normal inspection effort be devoted to this area. Inspection resources should be used to closely monitor operational activities during non-routine evolutions such as start-ups, shutdowns and reduced RCS inventory conditions. The team also recommends an increase in the monitoring of operational activities during outage periods and to closely follow the corrective actions to SEA 95-05, "Command and Control."

2.4 Programs and Procedures

The preliminary assessment noted that information was limited and definitive conclusions regarding performance in this area could not be developed. The preliminary assessment did note some problems related to procedure adequacy. For example, the procedure for venting the ECCS suction piping following maintenance was inadequate in that it did not include all of the vent valves necessary to properly vent the Unit 2 LPSI pumps prior to operation. This procedural weakness resulted in the air binding of a pump on March 9, 1995. In addition, on August 22, 1995, the procedure for venting the Unit 3 LPSI pumps was inadequate in that it did not identify three vent valves in the suction piping for the LPSI pump. This procedural weakness led to air binding of a LPSI pump three times before the operators identified the procedure deficiency.

While on-site the team observed implementation of multiple surveillance procedures, operating procedures, and an abnormal operating procedure. The team also reviewed various shutdown and operating procedures and interviewed operators and operations management in order to discuss procedure adherence and procedure adequacy issues. The team made several observations concerning the adequacy of procedural guidance, procedure validation, revisions and temporary changes, the SO123-0-23 abnormal alignment process, the clearance process, and the independent verification process. The observations are discussed in the following paragraphs.

Procedural Quality

The quality of normal operating procedures was found to be mixed. While the procedures seemed to contain all of the required precautions, limitations, prerequisites and procedural steps, they also were lengthy and difficult to use as noted by the team's review and interviews with operators and NOD auditors.

During the review of the operations deficiency systems, the team noted that operational performance had been impacted due to hard to follow procedural guidance related to the previously discussed loss of inventory event and a LPSI pump cavitation event. For the LPSI event, a SDC system surveillance procedure did not contain all of the precautions for limiting SDC flow when aligned to the 10 inch suction header. The surveillance procedure referenced the normal SDC operating procedure and required the operators to review it for any applicable limitations. The SDC operating procedure, section 6.8, referenced attachment 14, which then referenced attachment 7, to obtain the applicable pump operating limitations. The operators mistakenly referred to attachment 17, which did not have the appropriate limitations. Subsequently, when the LPSI pump was placed in operation on August 8, 1995, the pump began cavitating due to throttled suction flow.

While onsite, the team observed that while placing ion exchanger E-074 in service, the operator had to repeatedly transition from level to level to verify valve positions. The team concluded that better validation of the procedure would have reduced the number of transitions and made it easier for the operator. In addition, NOD noted additional procedure validation problems during observations related to SEA 95-05. The NOD auditors noted that verbatim following of procedures was difficult because the procedures were not written to be used in sequence and that procedure concerns come up often in that most procedures do not appear to support the expectation of sequencing. The NOD observations also indicated a need for better validation of procedures.

While observing control room activities, the team noted that almost all operating procedures had attached temporary change notices (TCNs) and that some specific procedures contained a large number of TCNs (20-40). The team noted that it had been several years since many of the operating procedures had been revised and most have not been revised since the 1980s. Interviews indicated that only 5 or 6 procedures were presently in the revision process and that the revision process was difficult and lengthy. Also, it was not clear what value the two year procedure review provided in that it did not ensure the operating procedures were being revised to incorporate the TCNs.

The inspectors noted that some of the TCNs appeared to have altered the intent of the original procedure and therefore they should not have been revised with the TCN process. For example, procedure, SO123-5-1.7, "POWER OPERATIONS," had 36 listed TCNs and several of these TCNs appeared to be intent changes. For example TCN 6-34 incorporated T.S. amendments #114 and #103, which added the number of MSSVs operable versus the number in-operable in order to comply with the amendment and added a note to address the new T.S. actions for less than 5 MSSVs operable. Additional examples included: TCN 6-32 which provided guidance for changing the vacuum trip set-points based on power level; TCN 6-21 which provided additional guidance for shutdown of the turbine generator and reactor at 35% power; and TCN 6-20 which provided the correct group 6 rod worth curve to be used for a rapid down-power transient. This process appeared to be in conflict with TS 6.8.3.a, Temporary Changes, which prohibits temporary changes if the intent of the procedure is being changed.

Based on the above, the team concluded that the area of procedure quality was a concern and in need of improvement. In addition, discussions with the operations procedure group indicated that operations management had acknowledged that the procedures were too wordy, had too many repeat precautions, too many notes, and in some instances could be confusing to the operators. The procedure group indicated that operations management had initiated a long term effort to shorten and simplify the majority of the operating procedures.

<u>SO123-0-23 Abnormal Alignment Process</u>

During the Unit 2 outage, the licensee had difficulty with leak checking of a pressure isolation check valve. In order to obtain an acceptable test, the licensee determined that it was desirable to put reverse pressure on the valve using the HPSI pump. During the test, NOD noted that the operator was reluctant to start the HPSI pump and when it was started, the pump did not have a flow path and became dead-headed because of an inadequate valve alignment. NOD also indicated that it was the fourth attempt at performing this check valve test.

The original procedure did not provide guidance on using the HPSI pump to perform the surveillance on the check valve. In the past, the licensee has used a process called the "0-23" process to develop abnormal alignments. Interviews with NOD indicated that in this case, the 0-23 procedure was not adequate in that it did not ensure a proper flow path for the HPSI pump.

The team determined that the 0-23 process allowed the development of this special surveillance procedure without the appropriate operations manager approval, which appeared to be in conflict with TS 6.8.2. Since this was a surveillance on a safety related component, an approved procedure was determined to be appropriate. It was also noted by the team that the licensee had not written a deficiency (such as a Near Miss or Challenge) for having an inadequate procedure that led to dead-heading the HPSI pump.

Clearance Process

The licensee's program for developing work authorization equipment clearances was determined to be good. A dedicated section of personnel with operations experience develop the individual clearances. Interviews indicated that maintenance and engineering personnel were routinely consulted during development of clearances and that the author of the clearance routinely performed a walk down of the clearance prior to release to operations. Clearances were technically correct; however, several clearance errors were noted in the licensee's deficiency reporting systems. A review indicated that most of the errors were due to implementation (operator performance) errors related to hanging of clearances or errors during partial removal/return to service of components.

Independent Verification Process

While observing an operator place the charging system ion exchanger E-074 in service, the team noted that the independent verification blocks, contained in the procedure, were not completed prior to placing the ion exchanger in service. It was also noted that the independent verification was not completed until several hours later. Licensee management stated that they believed the practice of performing an independent verification after the equipment was put into service, for non-technical specification equipment, to be acceptable. For equipment required to be operable by Technical Specifications, the licensee's procedures require independent verifications to be performed prior to declaring the component or system operable.

The team expressed two concerns with the licensee's practices for completing independent verifications. First, based on a review of the licensee's independent verification procedure and the actions observed, it would be acceptable to tie into a train of safety related equipment required by technical specifications, with either a train of safety or non-safety related equipment, prior to ensuring that the train was properly aligned via the independent verification process. In other words, should a mistake be made in the configuration of the system alignment, potential degradation of the operable train of equipment would occur. The licensee agreed to address this concern via a procedural change.

The second concern related to the potential vulnerability created by endorsing differing policies for how independent verification will be performed on technical specification versus non-technical specification equipment. Although not specifically prohibited by NRC regulations, the team concluded that this was a poor operational practice.

Conclusion

Overall, performance in the area of Programs and Procedures was lacking and the team recommends that increased inspection effort be implemented. The team recommends that inspection efforts focus on evaluating the licensee's progress in making revisions to the operating procedures and on ensuring the adequacy of any partial clearance removals implemented by the control room/work process center. The team also recommends inspection resources be used to closely monitor any activities performed under the "O-23" abnormal alignment process. In addition, the processes used for performing independent verification and for completing TCNs should be closely monitored.

3.0 ENGINEERING

The team determined that the licensee's overall performance in engineering was superior. The licensee performed and documented operability evaluations well. Management goals and priorities were properly communicated, and management expectations were understood and well received by the engineering staff. The engineering self-assessments thoroughly researched the identified problems, determined the root causes, and proposed appropriate corrective actions. Safety evaluations for plant modifications were performed thoroughly by appropriately trained engineers. The system engineering program was effective. The licensee had also established effective programs for barrier control, safety monitoring, steam generator tube integrity monitoring, instrument setpoint validation, and for real time display of plant data.

The team identified some weaknesses in engineering activities. The licensee had not appropriately considered the forces due to various operational modes of the auxiliary feedwater pump turbine trip and throttle valve in determining the torque switch settings for the motor operator. Also, the team was concerned that the licensee had not adequately resolved an inadequacy associated with the inverters for the shutdown cooling bypass valves.

3.1 Safety Focus and Management Involvement

Performance in the area of Safety Focus and Management Involvement was identified as being indeterminate during the preliminary assessment. The preliminary report mentioned examples of strengths such as good documentation of operability evaluations for non-conformance reports (NCRs), adequate assessment of steam generator blowdown line corrosion, and assessment of the failure of the middle stage of the reactor coolant pump seal. Blocking open water-tight doors to facilitate maintenance activities without evaluating the effects of a design basis flood was mentioned as an example of a weakness.

The team reviewed NCRs, licensee's self-assessments, and design documents and interviewed engineers and managers during the onsite phase of the inspection. The team selected seven NCRs for review and confirmed that the licensee's operability evaluations were performed well and were clearly documented.

In response to an issue regarding failure to perform a safety evaluation when two water-tight doors were left open (Inspection Report 93-29), the licensee issued a licensee event report, performed a formal root cause evaluation, and established an interim barrier control program. A comprehensive integrated barrier control program has now been implemented, and general procedure SO23-XV-4.500 has been issued to describe the requirements associated with the control of barriers and to provide direction for obtaining authorization to breach a hazard barrier. The team noted that this program was followed during the Cycle 8 outage. The licensee is currently finalizing a Licensee Controlled Specification for integrated barrier control for submittal to the NRC for approval.

The team interviewed system engineers and managers, and concluded that within the engineering groups, management goals and priorities were communicated very well. The expectations from senior management were understood and well received by the engineering staff. Management was involved in the review and approval of operability evaluations and plant modifications.

The instrument setpoint program was initiated by the licensee to systematically validate the instrument set-points in response to previous NRC findings. Design calculations have been completed for all safety-related set-points and for values used in the emergency operating instructions. The team reviewed setpoint calculations for one instrument, and noted they were thorough.

Personal computer work-station access to all plant engineering data and drawings is available through the Nuclear Consolidated Database (NCDB). Also, real time or historical plant data can be tracked from any computer on the network. The team noted that the availability of rapid access to plant data is an asset in problem solving and decision making.

Conclusion

Overall, the team concluded that engineering had demonstrated good safety focus in making appropriate operability and safety evaluations and in providing data and design basis information. Management was involved in safety-related decision making, and had established and communicated safety goals. On this basis, reduced inspection in this area is recommended.

3.2 Problem Identification/Problem Resolution

The team's in-office review concluded that the problem identification and problem resolution by engineering was superior. Problems, such as contamination of fuel pellets at a vendor's facility, incorrect addressable constants provided for the core protection calculator, and lack of tornado missile protection for portions of Units 2 and 3 AFW pump suction and mini-flow lines were identified and evaluated in a timely manner. However, the licensee did not issue NCRs to take corrective actions and evaluate the extent of conditions associated with a Furmanite repair used on a safety-related valve and with unqualified Agastat relays.

During the site visit, the team reviewed self-assessments, corrective actions, and root cause reports to determine the effectiveness of engineering groups in identifying and resolving problems. The self-assessment reports reviewed included: TDIR 94-008, "System Engineer Support of the On-line Maintenance Scheduling System"; TDIR 95-05, "Procedure Completion for Inservice testing of Pumps and Valves"; TDIR 95-07, "Timeliness of Acceptance Criteria Update"; DIR-NEDO-94-002, "Cancellation of a Design Modification After DCP Rev. 0 Issue"; and DIR-NEDO-94-004, "Review and Approval of Design Change Notices Used to Close Site Problem Reports."

In general, the licensee's self-assessments thoroughly covered the subject areas, determined root causes for problems, and proposed appropriate corrective actions. The team verified that the corrective actions were either implemented or were scheduled for completion. For example, DIR NEDO-94-004 evaluated problems in the review and approval of design change notices (DCNs) used to close SPRs. This review identified some minor administrative problems. Corrective actions included additional training of design engineering staff and periodic assessments of samples of engineering products for procedural compliance.

The team also reviewed the licensee's corrective actions concerning root cause analysis RCE 93-023, performed to address an issue regarding water tight barriers being blocked open. The root cause of this incident was attributed to the need to control passive design features that had not previously been considered by the licensee and that the safety evaluation process used to evaluate plant modifications did not fully consider the facility changes occurring during installation of modifications. Some of the recommendations in the report that were assigned to engineering were implemented as discussed in Section 3.1. Overall, the root cause analysis was determined to be effective.

Design engineers and system engineers stated that the SPR and NCR processes were easy to use and they routinely used these problem reporting methods. The team noted that system engineers documented problems during system walkdowns and in system reports issued periodically. During system walkdowns, the team noted deficiency tags were posted to mark hardware problems.

The backlog of NCRs had increased due to the dual unit outages, reversing the downward trend experienced before the outages. However, the backlog was being worked on after the outages, and had started to decline. The backlog of SPRs had been steadily declining during the past year. The licensee has established goals for reducing the backlog. Overall, within the engineering area, the backlog of NCRs an SPRs appeared to be effectively managed.

The team identified an example where an NCR concerning paint contamination of relays was prematurely closed out by engineering. During the associated operability assessment of NCR 95090086, it was stated that the relay vendor was performing additional testing to verify the effect of paint contamination of relays. The team questioned whether the vendor tests were being followed by the licensee. The licensee stated that the NCR was closed out inadvertently, but this issue was being tracked internally. Because a closed NCR cannot be reopened, the licensee issued a new NCR (95100053) on this issue.

Conclusion

Overall, the licensee's performance in the area of problem identification and problem resolution was generally superior. The team recommends that reduced inspection be implemented in this area.

3.3 Quality of Engineering Work

The team's in-office review indicated that the quality of engineering work was good. Work performed by the licensee in the areas of design changes, corrective actions for identified deficiencies, licensing submittals, and interdepartmental communications was generally good. Design changes and work requests contained proper safety evaluations, post-work testing and acceptance criteria, and assessments of the impact of the change on licensee programs. Engineering design changes and coordination with other departments were good. For example, modifications for correcting problems related to a stuck open pressurizer spray valve, installing thermowells in the CCW heat exchanger outlet piping, and for replacing a degraded solenoid for the main feedwater isolation valve were well engineered and coordinated with operations and maintenance. Examples of weaknesses in engineering work included: inadequate acceptance criteria specified for CCW pump discharge check valve reverse flow detection; not anticipating the effects of nitrogen ingress in the newly installed CCW makeup system; and not performing a conservative load sequence analysis for the diesel generators and including that sequence in the test program.

During the site visit, the team reviewed examples of permanent and temporary plant modifications, examples of NCRs, and one setpoint calculation. The team reviewed the status of drawing updates to incorporate the as-built plant configuration.

The team reviewed permanent plant modifications described in packages WR 2005, WR 2061 and WR 6988. The safety evaluations were correctly performed, impacts on interface systems were appropriately considered, and the technical contents of the packages were good. The team obtained training records and verified that the personnel that had performed the safety evaluations for these modifications had received appropriate training. At the time of the team's site visit there were no open temporary facility modifications (TFMs). Therefore, the team reviewed closed TFMs 2-94-BBA-001, 2-94-BBA-002 and 2-95-ABA-001. The technical justifications and safety evaluations for these modifications were appropriate. In response to the team's question, the licensee stated that permanent changes had been installed or repairs made, where needed, to resolve identified problems permanently after the TFMs were closed.

At the time of the inspection, the drawing backlog consisted of 15 control room drawings with one outstanding DCN each, and 10 non-control room drawings with 10 or more outstanding DCN's each. The licensee's procedure required that a non-control room drawing be updated within 30 days after the tenth DCN is issued. However, the licensee had been proactive in assigning priority to updating electrical wiring diagrams. The number of electrical wiring diagrams with 5 or more DCNs had been reduced to 94. There are a total of about 1100 electrical wiring diagrams with more than one outstanding DCN. Overall management of the drawing backlog appeared to be effective.

The team also reviewed the licensee's actions with regard to NCR 95100015 which was written on October 9, 1995, to document that the time to vent the standby component cooling water (CCW) pump took longer than usual. Because of gas accumulation problems, the standby CCW pump is vented every shift. The team reviewed NCR 90040041 dated April 17, 1990, which first reported the CCW pump gas binding problems in both units. The operability evaluation concluded that the standby pump would be considered operable provided it is vented daily until it is placed in service. The evaluation also stated that if for a week, negligible gas was released during the daily venting, the venting interval may be increased to once a week. The team questioned why the option to vent once a week had not been withdrawn because it appeared that the venting time had increased to 165 and 193 seconds on two occasions after a long period of normal venting time of less than 5 seconds. If the long venting time is indicative of larger volumes of gas in the pump, it would be critical to ensure that the pump is vented at least once per shift to preclude pump damage in the event that the pump received an auto start signal. The licensee stated that appropriate actions would be initiated to ensure that the venting frequency of once per shift was maintained.

Also, the team reviewed information pertaining to SPR 930700 which described a history of blown fuses for the circuits that supply electrical power to shutdown cooling (SDC) valve inverters 2Y006, 2Y007, 3Y006 and 3Y007. These inverters supply power to the shutdown cooling suction valves HV 9377 and HV 9378 in both units. The blown fuse issue was first documented in NCR GR-043 dated July 1, 1988. Recent fuse failures were documented in NCRs 92010171 and 95080179. The licensee's root-cause assessments and the manufacturer's evaluation concluded that the fuse was opening because of mis-commutation in the inverter's bridge circuit and marginal capacity of the inverters. The mis-commutation occurred due to the combination of low power factor and high inrush current at the beginning of valve stroke. From a review of licensee documents, larger valve motors than that originally specified were substituted during original plant construction, but the invertor size was not increased correspondingly.

The licensee's corrective action to this deficiency in the system design was to install two pre-wired spare fuses and a selector switch for each inverter so that successive attempts to open the valve could be made subsequent to a fuse opening during transition to or from the shutdown cooling mode of operation. On the basis of data from bench tests of a similar valve and probabilistic risk assessment, the licensee concluded that the design change was acceptable. The team was concerned that the inadequacy of the inverter to perform its intended function, and the uncertainty of operation of both shutdown bypass valves during post-accident conditions in the event of a failure of a normal shut down cooling valve, had not been adequately resolved by the licensee. This reliance on operator action to locally select an alternate fuse was not part of the original design basis of this equipment. The team noted that this modification to the original design may have increased the likelihood of equipment failure when comparing the as installed modification to the intended design of the system. The team identified this issue as Unresolved Item 50-361/95-01-01 and 50-362/95-01-01.

During the assessment, the team also observed a surveillance test failure in which the licensee was unable to re-latch the auxiliary feedwater (AFW) pump turbine trip and throttle valve HV 4716 in Unit 2 after the valve's trip function was tested. The valve motor tripped on high torque before the trip mechanism could be latched. The licensee initially concluded that the high torque was needed to overcome resistance due tc hardened grease in the valve latch mechanism. The team later learned that the torque switch for the motor actuator in question had been incorrectly set. The torque switch setting failed to account for the forces necessary to re-latch the trip mechanism. These forces were considerably greater than the forces required to stroke the valve. The team noted that appropriate setting of the valve motor torque switch, and proper lubrication and cleaning of the valve operating mechanism would have prevented the failure of the valve to re-latch. The licensee had not completed its investigation of the issue before the end of the inspection.

Conclusion

The team concluded that overall, the quality of engineering activities was adequate. Engineering weaknesses associated with the AFW pump turbine trip and throttle valve and with the shutdown cooling inverters indicate that a normal inspection effort should be maintained in this area.

Inspection effort should focus on ensuring the continuing quality of engineering work and that all component functions are considered when deriving component settings such as the AFW MOV torque switch settings. Also, inspection efforts should focus on ensuring that modifications to the plant design which could increase the likelihood of failure are submitted to the NRC for proper review.

3.4 Programs and Procedures

During the in-office review, the team had concluded that performance in the area of programs and procedures was indeterminate. The motor operated valve (MOV) and in-service testing (IST) programs were identified as being good. Examples of good programs for steam generator tube integrity monitoring, tracking and closure of reports on design basis documentation, and periodic testing of load shedding of non-safety-related and non-essential loads were also noted. Lack of quantitative acceptance criteria for HPSI pump operation in different modes, and not considering the AC transient on the DC bus during a failure of a switch were mentioned as weaknesses.

While on site, the team reviewed the system engineering program, interviewed system engineers, and discussed with the licensee, such programs as barrier control, the safety monitor, real time data display, the setpoint calculation program, and plant operating group (POG) functions.

The team interviewed the system engineers assigned to the AFW system, the salt water cooling system, and the emergency diesel generator system. The system engineers were knowledgeable of their systems, and had completed the required training. The team walked down the systems, and reviewed the system reports which had been periodically prepared by the system engineers. The system engineers demonstrated a thorough understanding of their roles and responsibilities in setting system goals, in performing periodic system walkdowns, and in problem identification. The system engineers were also involved in problem analysis, the IST program, and trending of pump and valve performance. The system engineers were performing their assigned duties well, and had coordinated their activities with maintenance, design engineering and operations.

The POG is part of the Nuclear Engineering and Design Organization (NEDO), and was created in 1993 to obtain station inputs to the design process, provide assistance to engineering, and coordinate station review of design packages. This group provides expertise in plant operations and maintenance to the design group, thus helping to reduce the rework rate of design changes. The POG reviews all plant design change packages and selected large FCNs. The POG was seen to be performing an effective interface by the assessment team.

The team observed that the licensee had implemented numerous data bases to aid in the performance of engineering work. The real time data display system (also known as WTREND) can be accessed from any personal computer, and provides historical and current plant data collected from plant computers. The Nuclear Consolidated Data Base (NCDB) system provides easy access to engineering data and plant drawings from a personal computer work-station. The team observed licensee engineers demonstrate easy access to these databases during data and drawing requests by the team.

To improve the performance testing of component cooling water (CCW) heat exchangers, the licensee had installed CCW temperature and salt water flow instrumentation. The heat exchanger data was acquired through a personal computer and calculations were performed on-line on the computer to extrapolate the test data to design basis conditions. This system is available for periodic testing and evaluation of the heat exchanger performance.

Conclusion

Overall, the licensee's engineering programs and procedures were good. The licensee has established a good system engineering program, and has initiated many site programs that appear to be contributing to the safe operation of the plant. On the basis of this inspection, the team recommends reduced inspection in this area.

4.0 MAINTENANCE

Overall, based on the preliminary report and the on-site inspection, the area of maintenance was determined to be adequate, with many areas of superior and some areas of weak performance. The licensee's use of the safety monitor to calculate risk in scheduling equipment outages and the reliability centered maintenance program were both seen as strengths within the maintenance program. Also, the maintenance leadership observation program was a strength in several aspects, including supervisory oversight, problem identification, and corrective action tracking. Other positive aspects of the maintenance department activities were the low threshold for identification of equipment deficiencies, the pre-programmed tagouts for all major components, and the proactive communications between maintenance, engineering, and operations.

One weaknesses observed within the maintenance area concerned a lack of human performance data in formal internal self-assessments. Also, one of the three maintenance performance based self-assessments lacked documentation on the root cause of the identified problems. In addition, an example of a poor maintenance practice was identified associated with a surveillance failure of the AFW turbine trip-throttle valve. One of the licensee identified causes of this valve's failure to re-latch was that hardened grease was not removed from the valve stem trip mechanism.

4.1 Safety Focus

During the preliminary assessment, the area of safety focus was determined to be superior. The licensee's process for planning, scheduling, and sequencing maintenance activities appropriately evaluated both the incremental and cumulative risk associated with work activities. The on-line maintenance program and the supervisory oversight of maintenance activities was stated as being excellent.

While on site the team reviewed the planning and scheduling program, the process for prioritizing maintenance activities, the on-line maintenance program, and the maintenance test review committee. Members of the planning and scheduling staff were interviewed and the procedures controlling the process were reviewed. A maintenance test review committee meeting was attended.

Planning and scheduling

The team concluded that the licensee's systematic approach of scheduling maintenance activities was a strength. The work window manager and a six week rotating schedule provided effective control over equipment and equipment "trains" to be out-of-service for maintenance activities. The use of computers for coordination of work boundaries during outage and on-line maintenance was considered to be an effective tool for determining work schedules. The safety priority given work was appropriate and risk was considered when maintenance activities were scheduled. The risk consequences associated with emergent work were also considered and work was often rescheduled to reduce calculated risk. For example, while the team was on site, the auxiliary feedwater turbine trip-throttle valve failed during the time a charging pump packing replacement was scheduled. The maintenance planning and scheduling group used the safety monitor, a computer program with risk modeling of plant components, to calculate the risk with both the auxiliary feedwater turbine trip-throttle valve and a charging pump out-of-service at the same time. With both components out of service, the risk increased to an unacceptable level, therefore, the charging pump packing replacement was moved to the next window that the charging pump could be removed from service.

Supervisory Oversight

Maintenance supervisory oversight was considered a strength. The licensee's Leadership Observation Program requires managers and supervisors to periodically observe on-going work activities and provide a written report to the maintenance manager ensuring in the field oversight of maintenance. For example, the Leadership Observation Program was effective at identifying and resolving problems with communications between shifts via the turnover process. The team verified that maintenance supervisors were concentrating efforts on maintaining staff participation and consistence in the maintenance shift turnovers.

Based on the team's work observations and discussions with several maintenance planners, the planning of work orders appeared to be adequate. The maintenance planners had ample plant equipment, vendor, and historical maintenance information available. The quality of the work planning documents was determined to be good.

Maintenance Test Committee

The licensee has established a maintenance test committee which is comprised of operations, engineering, and maintenance managers. The committee is tasked with reviewing maintenance activities to ensure that all post-maintenance and operability tests are appropriately identified. The team observed the maintenance test committee's actions with regard to the specification of test requirements for the auxiliary feedwater turbine trip-throttle valve. The committee thoroughly reviewed the requirements for ensuring that the valve could perform its intended function and met the Technical Specifications operational requirements.

Conclusion

Overall, based on the preliminary assessment and the subsequent on-site inspection, maintenance safety focus was determined to be superior. Reduced inspection effort is recommended in this area.

4.2 Problem Identification/Problem Resolution

Performance in the area of problem identification/problem resolution was identified as being indeterminate during the preliminary assessment. The one self-assessment program reviewed during the preliminary assessment, was found to consist primarily of quantitative information on performance during the conduct of maintenance activities. No significant analysis of performance data was provided with the assessment. The maintenance work backlog was identified as well managed. Also, the preliminary assessment indicated that actions to correct Nuclear Oversight Division identified problems were incomplete.

While on site the team reviewed the Maintenance Performance Annunciator Program, Leadership Observation Program, Performance Based Self-Assessment Program, and maintenance corrective actions. Maintenance managers and program coordinators were interviewed and program guidelines were reviewed. The team also reviewed what management actions were taken based on the generated program data.

The team determined that the maintenance department had three self-assessment processes, two of which had not been identified during the team's preliminary assessment. The Leadership Observation Program was used to identify problems by ensuring managers and supervisors were available to workers during maintenance activities and by requiring supervisors to observe and instruct workers. The program provided supervisors the authority to make on-the spot corrections for effective problem resolution. Also, the program provided for the trending and tracking of observations. The observations were categorized into three areas based on the significance of the problem. In addition, the observations were also categorized into concern categories for trending and for evaluating the need for conducting a performance based self-assessment. These trends were reviewed weekly using a six week running graph for comparison and a total of each category for the year. Maintenance management used the information from the leadership observation program along with other performance indicators in deciding on areas to conduct self-assessments. The team considered the Leadership Observation Program a strength, in that, it established an effective process for the immediate identification of problems, thus minimizing the safety implications. The program also was being used effectively to trend and identify programmatic safety concerns.

The maintenance performance annunciator program was part of a site wide program for assessing individual division (i.e., maintenance department) performance information and for transmitting the information to upper management. The program provided upper management with color coded annunciator windows indicating the quantity of units completed. The program included 23 colored annunciator windows including annunciators for corrective action requests, NRC notices of violations, overdue safety related preventive maintenance, and M&TE overdue calibrations. The team noted that human performance data from the leadership observation program was not, however, included in the performance windows. It was therefore unclear how maintenance management was communicating human performance data to senior licensee management. Also, the performance annunciator program did not contain a documented analysis of the performance data. The team considered this a weakness in that it was unclear as to what specific performance improvements were warranted or were being implemented based on the performance data.

The maintenance department's other assessment program was the Maintenance Performance Based Self-Assessment Program. This program provided the maintenance manager with a process for detailed assessment of areas of concern within the maintenance area of authority. The maintenance department had performed three assessments using this program. The first assessment was on the effectiveness of training maintenance personnel and was detailed and probing into the quality of training. A thorough analysis of the findings and good proposed corrective actions were documented within the licensee's assessment.

The second self-assessment was performed on tailboards (pre-briefings) and turnovers. The assessment on tailboards and turnovers did not contain the same level of detail as the assessment on training. This assessment identified problems that were discovered during the assessment and provided corrective actions for them, but the assessment did not perform a documented root cause of the identified problems. The corrective actions taken in response to the assessment appeared to be appropriate. A third assessment on maintenance planning was on hold since June 1995. Overall the team identified that the self assessment program added valuable insight into performance strengths and weaknesses within the maintenance area.

Conclusion

The team concluded the licensee's performance in the area of problem identification and problem resolution was superior. Reduced inspection effort is recommended in this area.

4.3 Equipment Performance/Material Condition

In the preliminary report, Equipment Performance/Material Condition was determined to be adequate. The preliminary assessment indicated improvements were being made in overall plant material condition; however, some material deficiencies were also noted. Plant equipment was stated as having operated adequately with some exceptions, such as several problems which were noted with valves.

While on site, the team toured plant spaces and walked down the salt water cooling system, and portions of the auxiliary feedwater, chemical and volume control, and component cooling water systems. The team also reviewed the program for plant equipment preservation. Overall, material condition of the plant was considered to be adequate. No major problems in equipment or system performance were discovered during the assessment. The team found that housekeeping of the plant spaces was good. The maintenance department had initiated a clean-up effort that included craft, supervisors, and managers performing hands-on clean-up functions. A plant equipment preservation program allocated maintenance personnel for rust removal and for applying protective coatings to equipment exposed to the harsh coastal environment. The maintenance department had solicited engineering input in selecting the most appropriate equipment coatings.

Conclusion

Overall, based on the preliminary assessment and the subsequent on-site inspection the licensee's performance in this area was determined to be adequate. Normal inspection effort is recommended in this area. The team recommends that inspection effort in this area focus on ensuring the continuance of the positive trend in improving plant material condition.

4.4 Quality of Maintenance

The quality of maintenance was stated as being adequate in the preliminary assessment. The maintenance department had established effective control of the surveillance program: however, problems with procedure adherence, foreign material control, and control of M&TE were noted in the assessment.

While on site the team observed numerous maintenance activities including electrical surveillances, electrical and mechanical preventive maintenance, electrical and mechanical troubleshooting, and corrective maintenance. A review was conducted of the maintenance order process, including the quality of the maintenance order content. The team also assessed the M&TE control program.

During the on sight observations, maintenance personnel performance appeared to be good. Pre-activity "tailboards" were conducted by the maintenance craft foreman for all observed activities. The tailboards included a discussion of job scope, plant contacts, potential problems, safety, and plant conditions. The coordination of maintenance activities with operations appeared adequate. Also, the craft were observed to adhere to procedures, including the performance of step verifications by a second person when required.

While observing the licensee activities relating to a surveillance failure of the auxiliary feedwater turbine trip throttle valve, the team reviewed the licensee's process for performing troubleshooting. The team identified that the procedure governing the troubleshooting process did not address requirements for QC verifications and post maintenance testing after troubleshooting; however, the licensee had not, nor had the inspection team, identified any instances of inadequate QC or post maintenance testing. The licensee determined that no changes were therefore necessary with the troubleshooting procedure. The team also observed an instance during the auxiliary feedwater turbine trip throttle valve troubleshooting, where the craft did not record an attempt to remove the stem nut without success. The stem nut was later removed and appropriately documented in the troubleshooting document.

The failure of the auxiliary feedwater turbine trip throttle valve was determined to be partially due to the hardening of grease used to lubricate the valve stem and over-speed trip collar. The preventive maintenance frequency for cleaning and lubricating these valve parts was increased during a revision of the MOV maintenance program in the later part of 1994. The preventive maintenance procedure did not require exposing and cleaning all of the stem, therefore allowing excess grease to accumulate and harden in the upper area of the yoke. This hardened grease, along with an improper setting of the MOV torque switch provided the conditions for the failure of the surveillance. The licensee was conducting a formal root cause investigation into the failure at the close of the inspection.

Maintenance management oversight was good as a result of implementation of the Leadership Observation Program. Recent procedure adherence problems appear to have been addressed properly by conducting a maintenance half-day stand-down and craft training. M&TE control problems have been addressed with new control procedures that have reduced the overdue and unaccounted for items from just less than 200 items to less than 10.

Conclusion

Overall, based on the preliminary assessment and the subsequent on-site inspection, performance in the area of quality of maintenance was determined to be adequate. Normal inspection effort is recommended in this area. Inspection effort should focus on maintenance work practices.

4.5 Programs and Procedures

The quality of maintenance programs and procedures was determined to be adequate in the preliminary assessment. The licensee appeared to have implemented an effective reliability-centered maintenance program that incorporated comprehensive reviews of individual component performance. Numerous instances were, however, identified during the preliminary assessment with inadequate maintenance procedures.

While on site the team reviewed electrical surveillance, mechanical surveillance, and preventive maintenance procedures. The team also assessed the reliability-centered maintenance program, the leadership observation program, and the on-line maintenance program.

No deficiencies were identified during the team's review of surveillance and preventive maintenance procedures. In response to a maintenance performance based self-assessment on training, maintenance procedures continue to be upgraded. The reliability-centered maintenance program included, as indicated in the preliminary assessment, a comprehensive analysis to determine what components would be subjected to periodic preventive maintenance. The reliability maintenance program effectively incorporated comprehensive reviews of individual components and established technically sound preventive maintenance practices. The program also has incorporated a continuous assessment of the performance of the program using a numerical rating of 1 to 5, determined by the craft, for each maintenance order performed. This rating indicated the effectiveness of the past maintenance in order to decide if changes to the schedule or type of maintenance were warranted. The team considered that the program provided valuable feedback on the effectiveness of the preventive maintenance performed.

Conclusion

Overall, based on the preliminary assessment and the subsequent on-site inspection, performance in the area of programs and procedures was determined to be adequate. Normal inspection effort is recommended in this area. The team recommends that future inspection effort in this area focus on the maintenance departments use and quality of procedures.

5.0 PLANT SUPPORT

In general, performance in the area of plant support was determined to be superior. Strengths included the establishment of effective training programs, the initiatives taken by Health Physics (HP) to reduce radiation exposure, the Emergency Planning (EP) staffing and facilities, the posting of radiation areas, aggressive self assessments, and good performance during EP exercises. Minor weaknesses identified included an increase in security infractions and two chemistry incidents that occurred during the team's onsite assessment.

5.1 Safety Focus

5.1.1 Radiological Controls

The preliminary report concluded that the licensee's performance was indeterminate in this area. Though the licensee had recently reduced the number of equipment leaks requiring drip catches and reduced the size of contaminated areas, such weaknesses as limited oversight of radiological safety problems, and high total station dose during some outage years were noted.

During the on-site assessment, the team determined that licensee management was vigilant in controlling contaminated areas and was active in decontaminating appropriate areas. In accordance with the ALARA principle, the licensee did not decontaminate areas that had a high probability of being re-contaminated. The current oversight system and practices are broad in scope and appear to be effective in involving management in significant radiological safety problems at an early stage. Review of the radiologically controlled area (RCA) access records and discussions with workers indicated that HP managers were appropriately visible in the RCA.

The team determined through interviews and tours of the steam generator nozzle dam mock-up training facility that the licensee had vigorously pursued the development of improved dams and dam installation procedures that have significantly reduced workers' dose over the last few years. It appeared that erroneous worker dose data obtained during earlier inspections might have resulted in a mistaken impression of licensee performance. According to licensee records, the collective worker dose for nozzle dam installation during the last outage was 2.8 person-rem rather than the 7 person-rem previously reported. This 2.8 person-rem figure may be compared to the 3.2 person-rem for the Unit 3, Cycle 7 outage, and the 11.6 person-rem for the Unit 2, Cycle 7 outage. This improved performance apparently resulted from an improved dam design, described by the licensee as an "in-house" development, and worker training and practice utilizing the licensee's steam generator mock-up.

The licensee had taken other actions designed to limit radiation dose to its workers, including the design and use of a reactor head shield, the design and use of a pneumatic bladder to enhance the use of water shielding in steam generator work, and the use of sub-micron filters in its letdown/cleanup system to reduce plant ambient radiation levels. Records showed that the licensee consistently met its dose goals established with input from the licensee's ALARA Committee. The licensee's accomplishments in this area were considered a strength.

Communication between HP and maintenance appeared to be effective. The effectiveness of communication between these two groups was enhanced because the maintenance manager was formerly in the HP Division. On-going cross-training of HP personnel in other groups should also enhance understanding and communication with other groups.

Conclusion

Overall performance in this area appeared to be superior. Reduced inspection effort is recommended.

5.1.2 Security

The preliminary report concluded that safety focus in the security area was good with licensee senior management stated as having provided strong support for the security program. Previous inspection reports also stated that the security staff was highly qualified and well trained. During the onsite inspection, the team reviewed self-assessment reports and division investigation reports, and noted that these reports were thorough and all corrective actions had been completed or scheduled to be completed. Senior management was involved in efforts to reduce security infractions and safeguards events, and had communicated management expectations to employees in a compelling manner.

Conclusion

Overall performance in this area appeared to be superior. The team recommends reduced inspection in this area.

5.1.3 Emergency Preparedness

During the in-office review, the team noted good management involvement and proper safety focus in the EP area.

During the site visit, the team interviewed EP staff and management, and performed a walkdown of the EP facilities. Review of performance during a recent drill indicated that the licensee continued to provide outstanding support to local and state emergency response personnel for implementing the EP program. A walkdown of the licensee's Technical Support Center (TSC), Operations Support Center (OSC), and Emergency Operating Facility (EOF) revealed that the facilities, equipment, and supplies had been maintained in a proper state of operational readiness. Equipment and instruments used for EP were found to be in calibration or had been appropriately inspected and inventoried on a periodic basis. Also, the EP department was adequately staffed to maintain the program effectively.

Conclusion

Overall performance in this area appeared to be superior. The team recommends reduced inspection in this area.

5.2 Problem Identification and Resolution

5.2.1 Radiological Controls

The in-office review of information in this area indicated that the HP Division was aggressive in addressing deficiencies in chemistry technician guidance, and was effective in investigating and evaluating spent fuel pool leakage problems. An apparent failure of the HP Division to recognize a series of inappropriate entries to HRAs as an adverse trend in radiation safety was noted as a weakness in the radiological event reporting system. This problem was reported by the licensees's quality assurance organization. Also, the licensee had not been effective in resolving the chemistry department's inability to draw and analyze a post-accident reactor coolant sample.

During the site inspection, the team noted that the HP Division had initiated a HP DIR shortly before the HRA entry problem was reported by NOD. However, the licensee's initial corrective actions were not effective in preventing repetition of these infractions, and the problem was not recognized as deserving of management's attention. As a result of the HP DIR, several actions were taken by the licensee in order to clearly convey management's expectations to plant staff, to more clearly define those Radiological Occurrence Reports (RORs) requiring management attention, and to enhance the process for recognizing adverse trends in the radiation protection program. The licensee's October 19, 1995, "Corrective Actions Effectiveness Audit" for the HP DIR found that the corrective actions, including worker and HP technician training, HP technician qualification manual revisions, and procedure revisions were appropriate and effective. The team confirmed these findings. As revised on July 10, 1995, the licensee's HP Division's "Health Physics Policy Statement III-9, Rev. 1," supplements the Radiological Occurrence Reporting (ROR) system and requires the trending of "work practice deficiencies, and the reporting of those evaluations to HP management." The policy statement also classifies "incidents and conditions" as "Level I" or "Level II". Level I (the most serious) incidents or conditions are to be reported to HP management "...in a timely manner". Level I includes adverse trends.

The inspector determined from a review of recent RORs that the reports were timely, well-written, concerned significant events, were processed promptly, and were followed by appropriate corrective actions. It now appeared that the licensee has taken adequate action with respect to recognizing and reporting adverse trends in radiation safety and that licensee management was actively involved in implementing corrective actions.

In addition, the HP Division's recent initiatives regarding the posting of radiological areas were considered a strength. All HRA inserts in the RCA postings are now fluorescent pink so as to be clearly recognizable as different from any other insert, such as "Radiation Area". Also, the posting of areas where radiological conditions have changed (e.g., increased radiation levels, increased contamination levels) now includes a fluorescent orange "stop" sign informing workers that conditions had changed and that the workers should review the latest information on the conditions in the area. The team observed during plant tours that the new postings were effective.

The team reviewed DIR 94-009 which documented the corrective actions for the problems associated with drawing and analyzing a post-accident coolant sample. The corrective actions included a discussion of the incident by the chemistry supervisor with the licensee's chemistry technicians, the stressing of the importance of following the sampling procedure verbatim, and a revision of the sampling procedure to make it easier to follow. Samples had been successfully taken and analyzed following the revised procedure.

Conclusion

In summary, actions taken to improve the effectiveness of the corrective action system have been taken; however, the effectiveness of the corrective action system's ability to identify adverse performance trends has yet to be fully demonstrated. Overall performance in this area was determined to be adequate. Normal inspection effort is recommended in this area. Inspection effort should focus on evaluating the effectiveness of the corrective action and reporting systems during periods of high activity such as outage conditions.

5.2.2 Security

The team's in-office review identified good performance with regard to compliance with the physical security plan and implementation of the QA program for the security system computer software. Training and the qualifications of the security staff were also found to be satisfactory. Divisional self-assessments and QA audits had identified minor procedural compliance errors and security infractions. The licensee had taken appropriate corrective actions to the assessment findings.

During the site inspection, the team reviewed self-assessment reports RCE 95-07, DIR-SEC-94-01, and DIR-SEC-95-01. The reports were thorough and the required corrective actions to resolve the identified problems were either completed or were in progress. Reportability Disposition Sheet (RDS) 95-051 stated that when the Unit 2 interior escape hatch was opened per procedure SO123-IV-6.3, "Security Alarm Testing Program", no alarm was received. In September 1985, this alarm point for each unit was deleted from the security computer after a review of the physical security plan. The team questioned why this error in the procedure went undetected for about 10 years, especially when testing was required to be performed every outage. The licensee stated that the older version of the procedure did not list each alarm point in the system separately, and that the revision issued in February 1992 erroneously listed the interior escape hatch alarm. The procedure has now been revised to reflect the actual configuration. The licensee provided test records for the previous outages which showed that these alarms were not tested for ALARA reasons.

Every month, two or three internal audits to verify proper performance of security officer functions were performed. QA performed audits once a year, in addition to special audits which were also performed. Corporate security performed annual audits of each segment of the security program. The Safety Engineering Group performed root cause evaluations for events, such as those associated with the issuance of security badges prior to receiving drug screen results. The recommended corrective actions to the evaluations were verified as having been completed.

Conclusion

Overall, in the area of problem identification and problem resolution, the licensee's performance was superior. The team recommends reduced inspection in this area.

5.2.3 Emergency Preparedness

During the in-office review, the team had concluded that an effective system had been established to identify and inform management of problems.

During the site visit, the team reviewed the 1994 QA audit report and determined that the deficiencies and field corrected errors identified by QA were resolved adequately. Two CARs mentioned in the report were also resolved satisfactorily. The EP Department also conducted performance assessments each quarter. A review of the performance report for the third quarter of 1995 indicated that performance in all EP areas was strong. The licensee's procedure SO123-XV-4, "Site Emergency Preparedness Division Corrective Action System," Revision 2, provided good guidance for identifying, evaluating and documenting deficiencies.

All corrective action items assigned to the EP area had been addressed. The team noted that recommendations from EP exercises and drills were tracked through the Generic Tracking System, and were resolved in a timely manner. The team concluded that the licensee had established adequate controls in identifying and resolving plant issues related to EP.

Conclusion

Overall, the licensee's performance in this area was superior. The team recommends reduced inspection in this area.

5.3 Quality of Plant Support

5.3.1 Radiological Controls

The team's in-office review of this area indicated average performance with minor problems in radiological housekeeping, improper entries to HRAs between

January and May of 1995, untimely documentation of radiation surveys, and improper handling of contaminated materials.

During the site inspection, the team evaluated housekeeping and radiological practices in the areas outside the containment and found them acceptable. The licensee appeared to have taken appropriate action to prevent the repetition of the HRA entry problem. The team noted that in several instances during the last outage the licensee had not properly posted entrances into HRAs. This issue was the subject of HPDIR 95-02. The DIR included appropriate corrective actions, including immediate actions. These corrective actions were the subject of a DIR corrective actions effectiveness audit in October 1995. The audit report stated that all but two of the actions had been completed, and the remaining were scheduled for completion.

The inspector noted that many members of the radiation protection staff were certified by the American Board of Health Physics or the National Registry of Radiation Protection Technologists. The team noted that the licensee actively supported training of its personnel toward certification.

Another strength within the HP Division was its extensive cross-training effort, including the training of HP personnel as reactor operators. The team also noted active management support of the ALARA program, including an incentive program which included cash awards and paid vacation time. On the basis of discussions with a number of plant workers and HP technicians, the team noted that there was a good working relationship between the radiation protection organization and the workers, and that each was aware of its own and the other's responsibilities.

Conclusion

Overall, the licensee's performance in this area was superior. The team recommends reduced inspection in this area.

5.3.2 Security

During the preliminary assessment, review of inspection reports, LERs, licensee audits, and self-assessments showed that the licensee was effectively managing the security program. Security supervisors and staff at the alarm stations were well trained and alert. The physical security plan, implementing procedures, vital area barriers, vital area detection aids, reports, access authorization program, and fitness-for-duty program all adequately complied with regulatory requirements.

The security computer had recently been upgraded with new hardware and new software that is faster and has more capability. Improvements in perimeter detection systems have also been made.

The quarterly self-assessments for 1995 indicated an increase in the number of security infractions, corrective action requests, and safeguard events. Two NRC notices of violation were issued this year relating to authorizing unescorted access to individuals before the results of drug testing were available, failure to protect safeguard information, and not logging certain events in the safeguard events log.

Conclusion

Overall the licensee's performance in the area of quality of security was determined to be adequate. The team recommends that normal inspection be maintained in this area.

5.3.3 Emergency Preparedness

During the in-office review, the team had concluded that the licensee had assigned trained and qualified staff for rapid activation of the emergency response facilities. Quarterly exercises and annual drills continue to demonstrate that the EP program was strong and effective.

During the site visit, the team interviewed licensee staff and reviewed requirements for the annual exercise and drills in accordance with procedure SO123-VIII-0.200,"Emergency Plan Drills and Exercises," Revision 2. The licensee was performing annual exercises and drills in accordance with the above procedure. The team reviewed the critique report for the annual exercise conducted on October 11, 1995, and also discussed the results of the exercise with the EP staff. The licensee staff were knowledgeable in the EP plan, facilities and equipment. Corrective actions had been specified to address the findings from the exercise and were being tracked in their Nonregulatory Action Tracking System. The NRC team that monitored the exercise concluded that the licensee's critique process, command and control, and prioritization of actions by the control room simulator crew and the OSC and TSC staff were strengths.

Conclusion

Overall, performance in this area was determined to be superior. The team recommends reduced inspection for this area.

5.3.4 Chemistry

Although the team did not conduct a programmatic review of the activities under control of the plant chemistry department, two events involving the chemistry group occurred during the inspection period and were evaluated by the team. One event involved an incorrect calculation of a vent monitor setpoint on a gaseous effluent release permit. Preliminary information indicated that an incorrect identifier for the vent monitor was entered into the computer program used in calculating the setpoint. This error apparently resulted in the determination of a monitor setpoint that was more than 6 orders of magnitude too high. A review of monitor data showed that the setpoint that should have been used was not exceeded during the release.

The second event involved the release of gases resulting from the use of hydrochloric acid in the chemistry laboratory and the entry of these gases into the plant's control room(s). Preliminary information indicated that the chemistry technician was not performing the task in a hood as required. It was also indicated that the fume hood ventilation had been shut down as part of a surveillance procedure, and that the chemistry technician was not aware that the ventilation was shut down. Both events are the subjects of on-going investigations.

<u>Conclusion</u>

Overall performance in this area was determined to be adequate. The team concluded that normal inspection effort should be directed towards ensuring proper control and implementation of the chemistry program as it applies to safety related activities.

5.4 Programs and Procedures

5.4.1 Radiological Controls

The team's preliminary review indicated generally good performance in this area. However, the review was limited to chemistry and radiological analytical measurement programs.

The team reviewed several of the licensee's procedures during the site inspection. In general, the procedures were of appropriate scope and depth, and were easy to read and understand. Based on a sample review, the team did not identify any instances where a procedure was needed and was not available.

<u>Conclusion</u>

Overall performance in this area was determined to be superior. The team recommends reduced inspection effort in this area.

5.4.2 Security

During previous NRC inspections the licensee's physical security plan was determined to be effective. Programs and procedures for access authorization, fitness-for-duty, searching packages and material, and control of vehicles in the protected area were also noted to be good.

While on site the team identified that licensee efforts to simplify and upgrade security procedures have reduced the total number of procedures from about 30 to 15. Procedural compliance errors have been low.

<u>Conclusion</u>

The team concluded that the licensee's performance in this area was superior and recommends reduced inspection in this area.

5.4.3 Emergency Preparedness

During the in-office review the team had concluded that the EP program had been implemented effectively and that the training organization had maintained an effective emergency response training program.

During the site visit, the team identified the licensee had properly reviewed and submitted to the NRC the emergency plan and implementing procedures. No changes to the emergency plan had been made since the last NRC inspection. A review of selected training qualification records of several emergency response staff members indicated that their training was current and met the training requirements delineated in procedure SO123-XXI-1.11.3, "Emergency Training Program Description," Revision 3. The team noted that the licensee had trained and qualified approximately 1220 personnel to handle the various emergency response functions. The licensee's training program was identified as a strength.

Conclusion

Overall, the licensee's performance in this area was determined to be superior. The team recommends reduced inspection in this area.

6.0 EXIT MEETING

At the conclusion of the inspection the team conducted an exit meeting that was open for public attendance. During the exit meeting, the team's findings were presented. A copy of the team's presentation which was provided to the meeting attendees is contained in Appendix B. The following people were in attendance.

Southern California Edison

NAME

David Axline, Licensing Engineer
Kenneth M. Bellis, Manager, Emergency Preparedness
William C. Boos, Operations Coordinator
Daniel P. Breig, Manager Technical
Michael J. Bua, Unit 2/3, Chemistry Supervisor
Jim R. Clark, Manager, Chemistry
Terry L. Cooper, Health Physics Engineer
John F. Fee, Manager Maintenance Operations
Greg Gibson, Manager, Compliance
Pamelac Handley, Supv. Emergency Preparedness
Peter J. Knapp, Manager, Health Physics
Russ Krieger, VP Nuclear Generation
James A. Madigan, Supvervisor Health Physics
Mark S. Mihalik, Project Engineer
G.L. Plumlee, III, Supervisor, Compliance
Jack L. Rainsberry, Plant Licensing Manager
Harold Ray, Executive Vice President
Dick Rosenblum, Vice President Engineering and Technical Support
Rob Sandstrom, Manager, Nuclear Training Department
R. Scott Schoperd, Health Physics Supervisor
Michael P. Sholt, Manager, Site Technical Services
Ken Slagle, Manager, Nuclear Oversight Division
Martin J. Speer, Manager, Site Security
Owen J. Thomsen, Manager, Nuclear Fuel Management

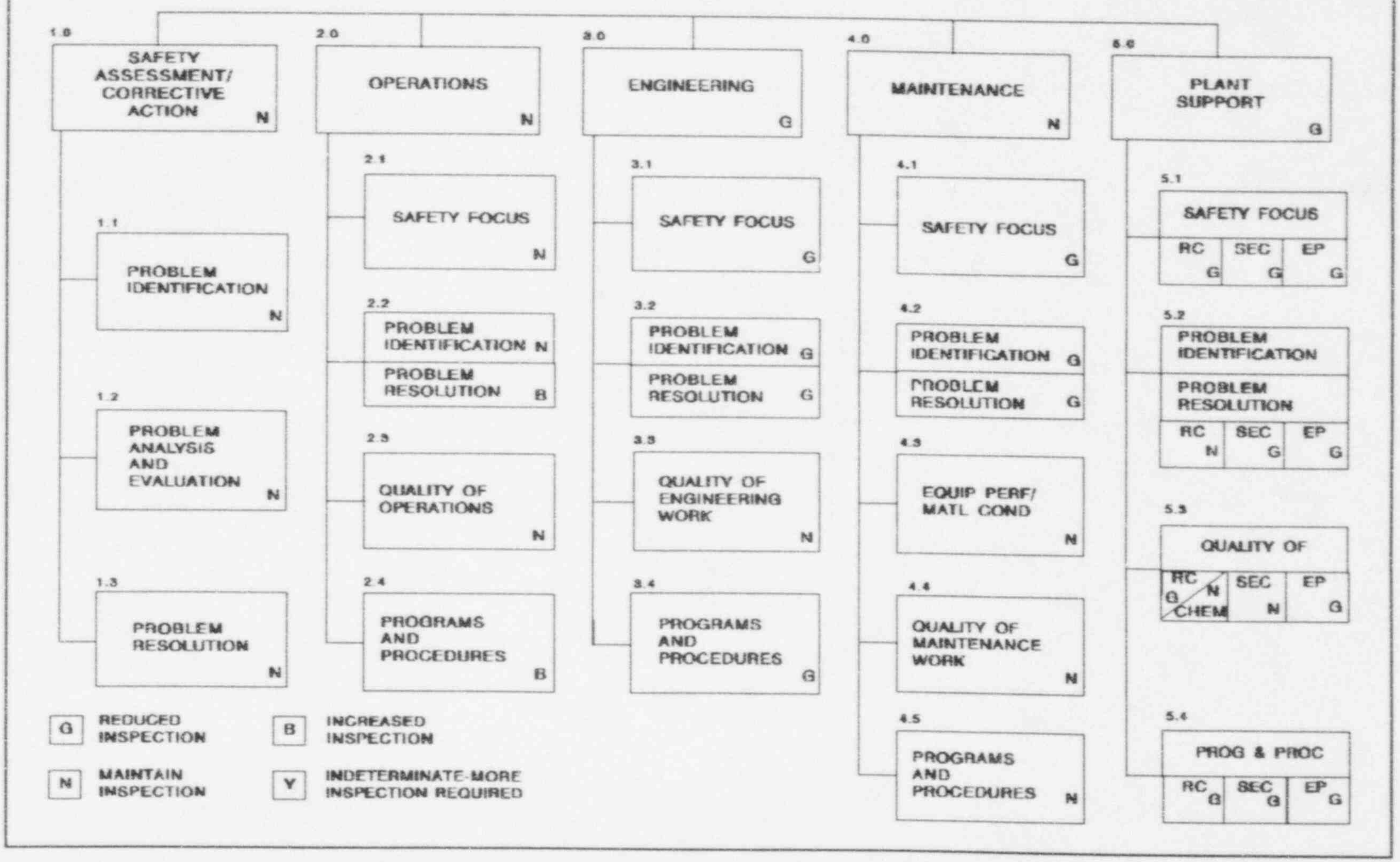
Mark S. Tolson, Lead Fire Protection Engr.
Theodore J. Vogt, Plant Superintendent
Michael A. Wharton, Manager Engineering Design
W.G. Zintl, Manager, Emergency Preparedness

Nuclear Regulatory Commission

Ken Brockman, Deputy Director, Division of Reactor Safety, Region IV
Leonard Joe Callan, Regional Administrator, Region IV
Forrest Randall Huey, Branch Chief, Projects Branch F, Region IV
James Isom, Operations Engineer, Special Inspection Branch, NRR
Jeffrey Jacobson, Team Leader, Special Inspection Branch, NRR
Raymond P. Mullikin, Reactor Inspector, Region IV
Donald P. Norkin, Section Chief, Special Inspection Branch, NRR
James Sloan, Senior Resident Inspector, Region IV
Joseph I. Tapia, Acting Branch Chief, Operations Branch, Region IV

SAN ONOFRE UNITS 2 AND 3

FINAL PERFORMANCE ASSESSMENT/INSPECTION PLANNING TREE



APPENDIX B

SAN ONOFRE UNITS 2 AND 3 INTEGRATED PERFORMANCE ASSESSMENT PROCESS

EXIT MEETING

JEFFREY JACOBSON: TEAM LEADER

OUTLINE OF PRESENTATION

INTRODUCTIONS

OBJECTIVES AND SCOPE

TEAM CONCLUSIONS

PRESENTATION OF FINAL PERFORMANCE ASSESSMENT/INSPECTION PLANNING TREE

CONCLUDING REMARKS

ASSESSMENT OBJECTIVES AND SCOPE

TO IDENTIFY PERFORMANCE STRENGTHS AND WEAKNESSES

- SAFETY ASSESSMENT/CORRECTIVE ACTION
- OPERATIONS
- ENGINEERING
- MAINTENANCE
- PLANT SUPPORT

COVERS TWO YEAR PERIOD- SEPTEMBER 93 THROUGH OCTOBER 95

IN OFFICE REVIEW, ON SITE REVIEW, INSPECTION RECOMMENDATIONS, REGULATORY EFFECTIVENESS

ASSESSMENT RESULTS

OVERALL SAN ONOFRE WAS FOUND TO BE A SAFE AND WELL OPERATED FACILITY

NO MAJOR PROGRAMMATIC WEAKNESSES IDENTIFIED

SAFETY ASSESSMENT/CORRECTIVE ACTION

CORRECTIVE ACTION (REACTIVE) VS. PERFORMANCE ASSESSMENT (PRO-ACTIVE)

EVALUATED ORGANIZATION'S ABILITY TO IDENTIFY AND CORRECT WEAKNESSES ASSOCIATED WITH OPERATIONAL PERFORMANCE

STRENGTHS

ABILITY TO IDENTIFY AND CAPTURE HARDWARE, DESIGN, AND PROCEDURAL DEFICIENCIES

ROOT CAUSE ANALYSES

THE CAR PROCESS

REVIEW OF INDUSTRY INFORMATION

SAFETY ASSESSMENT CORRECTIVE ACTION

WEAKNESSES

INEFFECTIVE SURVEILLANCE AUDITS

MISCLASSIFICATION OF DEFICIENCIES ON SPRs

LACK OF INTEGRATION OF HUMAN PERFORMANCE DATA INTO NOD ASSESSMENTS AND SITE-WIDE TRENDING PROGRAMS

INCONSISTENT IDENTIFICATION OF IMPROVEMENT AREAS IN NOD QUARTERLY REPORTS

LACK OF PROCEDURAL GUIDANCE FOR TRACKING IDIR CLOSEOUT. YEARLY AUDIT OF DER PROCESS NOT PERFORMED.

RESPONSE TO AFW TURBINE TRIP AND THROTTLE VALVE FAILURE

OPERATIONS

STRENGTHS

CURRENT MANAGEMENT OVERSIGHT OF CONTROL ROOM ACTIVITIES

TAILBOARDS AND TWO WAY COMMUNICATIONS IN CONTROL ROOM

IDENTIFICATION AND RESOLUTION OF CONTROL BOARD DEFICIENCIES

WEAKNESSES

UNTIMELY CORRECTIVE ACTIONS TO OPERATOR PERFORMANCE PROBLEMS

OPERATOR KNOWLEDGE REGARDING SYSTEM SPECIFICS AND SYSTEM INTERACTIONS

COMMUNICATIONS TO SENIOR MANAGEMENT REGARDING PERFORMANCE TRENDS

QUALITY OF NORMAL (VS. EMERGENCY) OPERATING PROCEDURES

ENGINEERING

STRENGTHS

OPERABILITY EVALUATIONS

MANAGEMENT COMMUNICATIONS AND SAFETY FOCUS

ENGINEERING SELF ASSESSMENTS

QUALITY OF MODIFICATION PACKAGES

SYSTEM ENGINEERING PROGRAM

USE OF COMPUTERIZED DRAWINGS AND DATA BASES

PROGRAMS FOR STEAM GENERATOR INTEGRITY AND FLOOD BARRIER CONTROL

ENGINEERING

WEAKNESSES

MISCLASSIFICATION OF TWO DESIGN DEFICIENCIES AS IMPROVEMENTS VIA SPRS

FAILURE TO ACCOUNT FOR RE-LATCH FORCES IN AFW VALVE SETTINGS

UNDERSIZED INVERTORS FOR SHUTDOWN COOLING LOOP ISOLATION VALVES

MAINTENANCE

STRENGTHS

USE OF SAFETY MONITOR FOR SCHEDULING EQUIPMENT OUTAGES

PRE-PROGRAMMED TAG-OUTS FOR ALL MAJOR COMPONENTS

SUPERVISORY FIELD OBSERVATION PROGRAM

LOW THRESHOLD FOR PROBLEM IDENTIFICATION

COMMUNICATIONS BETWEEN MAINTENANCE, OPERATIONS, AND ENGINEERING

RELIABILITY CENTERED MAINTENANCE PROGRAM

MAINTENANCE

WEAKNESSES

COMMUNICATION OF HUMAN PERFORMANCE DATA

PREVENTATIVE MAINTENANCE PRACTICES ON AFW MOV

PLANT SUPPORT - EP

STRENGTHS

TRAINING PROGRAM

PROBLEM IDENTIFICATION SYSTEM

FACILITIES AND EQUIPMENT

PERFORMANCE DURING EXERCISE

WEAKNESSES

NONE

PLANT SUPPORT - SECURITY

STRENGTHS

MANAGEMENT SUPPORT

SELF ASSESSMENTS

PROGRAMS AND PROCEDURES

WEAKNESSES

INCREASED NUMBER OF INFRACTIONS

TWO VIOLATIONS

PLANT SUPPORT - HP

STRENGTHS

TRAINING PROGRAMS

PROCEDURES

HP RELATIONSHIP WITH CRAFT

WEAKNESSES

LACK OF RADIOLOGICAL DATA CONTAINED ON RADIATION EXPOSURE PERMITS

PLANT SUPPORT - CHEMISTRY

TWO RECENT INCIDENTS NOTED

ONE CONCERNED A CALCULATION FOR AN OFF-GAS RADIATION DETECTOR

ONE CONCERNED A LACK OF VENTILATION CONTROL DURING A CLEANING EVOLUTION