SAN ONOFRE NUCLEAR GENERATING STATION
SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE
Report 50-361/95-99; 50-362/95-99

I. BACKGROUND

The SALP Board convened or January 18, 1996, to assess the nuclear safety performance of San Onofre Nuclear Generating Station for the period July 1, 1994, through December 30, 1995. The Board was conducted in accordance with Management Directive 8.6, "Systematic Assessment of Licensee Performance." The Board members included: J. E. Dyer (Board Chairperson), Director, Division of Reactor Projects; T. P. Gwynn, Director, Division of Reactor Safety; and W. H. Bateman, Director, Project Directorate IV-2, Office of Nuclear Reactor Regulation. This assessment was reviewed and approved by the Regional Administrator.

Functional Areas and Ratings:

	Current	Previous
Plant Operations	2	1
Maintenance	2	2
Engineering	1	2
Plant Support	1	1

II. OPERATIONS

Overall safety performance in the operations area was considered good, representing a decline from the superior performance noted during the previous SALP period. Throughout this assessment period, at-power operations were conducted relatively well, resulting in long periods of stable power operations. Management continued to demonstrate a conservative operating philosophy, as evidenced by the prompt shutdown of the units to resolve deficient or questionable plant material conditions. However, the lapses noted last SALP period with operator control of system configurations continued during this assessment period and caused problems during both the Unit 2 and Unit 3 refueling outages. At the end of the current assessment period, improvements were noted with operations performance, but additional actions are necessary to return to overall superior performance.

Early in the assessment period, consistent performance standards for procedure adherence, shift turnover, communications, and coordination of plant activities were not effectively implemented among operating crews. These weaknesses became particularly apparent in the Unit 2 outage and resulted in several events, including an inadvertent reactor coolant system draindown and a plant heatup without verification of oxygen concentration. In response to an NRC special inspection, a licensee self-assessment was conducted and comprehensive improvement plan developed. Management took aggressive actions to eliminate operator distractions and improve control room supervisory oversight, shift turnovers, and operator communications. Implementation of these short-term corrective actions resulted in fewer observed problems during

the subsequent Unit 3 outage, but continued implementation of long-term actions is necessary.

Operating procedures were often complex, frequently referring to other procedures and numerous attachments. Procedure weaknesses contributed to several Unit 2 outage events and more recently resulted in the cavitation and air binding of low pressure safety injection pumps during the Unit 3 outage. In contrast, emergency operating procedures were found to be generally effective during license examinations and NRC inspections.

During this assessment period, operator performance was mixed. Planning for evolutions at power was usually thorough, resulting in no plant trips or significant operating events. Operator response to plant transients and events was excellent, as demonstrated during a significant offsite grid disturbance, manual trips due to equipment problems, and a forced shutdown due to a suspected component cooling water leak. However, operators did not always effectively monitor plant conditions and control plant activities during outage periods. The more notable examples include running a high pressure safety injection pump for 2 hours without cooling water, in addition to the Unit 2 draindown event and plant heatup without verification of oxygen concentration.

Operator training programs were generally effective, resulting in a high pass-rate of license exams. The training program had an effective feedback mechanism to adjust training to meet station needs and several initiatives were being implemented to customize and expand training to both licensed and nonlicensed operators. Some problems were noted with the quality of requalification exams and, in one instance, the wrong written exam was administered.

Routine Operations Division and Nuclear Oversight Division assessments identified problems with the conduct of operations before the April 1995 events at Unit 2, but corrective actions did not adequately address the root cause of the problems. After the Unit 2 events, a comprehensive benchmarking of performance was conducted that identified significant shortcomings with operator command and control activities. Corrective actions resulting from this more recent assessment appear to be thorough and have improved performance, but remain to be fully implemented. Operations management has implemented an enhanced performance monitoring program to evaluate operations improvements and adjust corrective actions.

The performance rating is Category 2 in this area.

III. MAINTENANCE

Safety performance in the maintenance area improved, but remained good overall. Of particular note was the effective resolution of concerns raised during the previous SALP period related to supervisory involvement and the ability to be self-critical. Strengths included management oversight, the leadership observation program, the reliability centered maintenance program,

the use of probabilistic risk information when scheduling maintenance, and eddy-current examination activities of steam generator tubing. Significant progress was also made in the preservation of structures and components exposed to harsh environments. Nevertheless, improvement of procedure adherence, the quality of procedures, and the performance of surveillance testing remained as management challenges.

Management oversight of maintenance performance significantly improved since the last assessment period, with a self-critical approach clearly evident. Management action to stand down from work activities to address performance problems was a significant step toward improving human performance in the maintenance area. The leadership observation program proved to be an effective tool in the identification of performance trends and programmatic safety issues. Supervision was closely involved in overseeing the performance of the maintenance crafts. This activity contributed to improvement in several areas, including the control of measuring and test equipment.

Both units operated well throughout the assessment period, indicating good overall plant material condition. The licensee made significant progress in improving the preservation of plant structures and components exposed to harsh environments. Material condition discrepancies were identified with an appropriately low threshold, and the work-it-now program contributed to the efficient performance of minor maintenance.

Maintenance and surveillance programs were generally appropriate. The preventive and predictive maintenance processes were enhanced by the implementation of a reliability centered maintenance program that provided valuable feedback on the effectiveness of work performed. Maintenance work scheduling was significantly enhanced through the use of probabilistic risk information to minimize plant risk during the performance of maintenance. Several opportunities for improvement in the quality of procedures and the performance of surveillance testing were noted, although fewer procedure quality problems were identified by the NRC during the latter portion of the assessment period.

The scheduling and performance of surveillance activities were generally well controlled and executed. Eddy-current examination of steam generator tubing was a notable example. Nevertheless, an inoperable Unit 3 emergency diesel generator caused by improper test performance, a semi-annual subgroup relay test on the wrong train in Unit 3, and an unnecessary plant transient caused by main steam safety valve testing all indicated that additional opportunities to further improve performance existed in this area.

Continued challenges involving procedure adherence by maintenance personnel and their supervisors were evident throughout this assessment period. To address the continuing procedure adherence concerns, the licensee revised administrative guidelines for the conduct of maintenance in February 1995 to increase procedure flexibility. Subsequently, maintenance personnel experienced some confusion concerning the proper implementation of the changes. For example, during the Unit 3 outage, numerous procedure

verification discrepancies were identified, including maintenance on two salt water cooling pumps, a reactor coolant pump, and an emergency diesel generator. In addition, confusion existed concerning the implementation of foreign material exclusion controls for work in the area of the Unit 3 pressurizer during the outage. In a later instance, maintenance crafts did not complete required documentation of work activities on the Unit 3 containment spray pump impeller indicating continued management attention to improving human performance was still required.

Maintenance management made notable improvements in its self-assessment capability. Both internal and external assessments were used to judge departmental performance. Self-critical assessments identified valuable insights concerning maintenance performance strengths and challenges. Of note was a detailed and probing assessment of the effectiveness of maintenance training that included a thorough analysis of the findings and good proposed corrective action. Management attention was directed toward the resolution of the identified problems.

The performance rating is Category 2 in this area.

IV. ENGINEERING

Overall engineering performance improved during this SALP period and was considered to be superior. Management made significant progress in correcting weaknesses identified in the previous SALP period in the areas of oversight of plant modifications, corrective action resolution, and quality of licensing submittals. Licensee management made conservative decisions with respect to plant safety and had instituted several excellent long-range programs to optimize plant life.

Management effectiveness was excellent. Goals and priorities set by senior management were understood, well received, and effectively implemented by the engineering staff. The development of a comprehensive steam generator strategic management plan and the decision to thoroughly inspect the main turbines during the 1995 refueling outages were thoughtful decisions aimed at maximizing useful plant life.

The licensee's engineering programs and procedures were excellent. The licensee had initiated many site programs that contributed to the safe operation of the plant. An example was the depth of component failure analysis, which had contributed to significant, progressive improvements in component reliability.

Design engineering continued to play a strong role in assuring plant safety. The continued effective use of the commercial grade dedication laboratory, the ability to rapidly access plant data using desktop computers, and the aggressive investigation of emerging issues were examples of superior engineering effort. The recent discovery by the licensee that certain high energy line breaks could adversely affect nearby safety-related areas through the normal ventilation system and the implementation of appropriate

compensatory measures also illustrated the strength of the Design Engineering Division. The NRC identified minor inaccuracies in the Updated Final Safety Analysis Report (FSAR). The overall expertise of the licensee in using probabilistic risk assessment (PRA) to support plant operations was excellent. However, a deficiency was observed with the use of a PRA justification with inherent uncertainties to support the regulatory analysis in a control room toxic gas detection system amendment request.

Engineering support for operations and maintenance activities was timely, thorough and, in general, superior. Diagnoses of equipment failures, and investigation and resolution of emerging issues were excellent. Operability determinations were well written and reflected conservative engineering judgment. The high level of engineering presence in the plant to support maintenance activities was considered a strength.

Overall, engineering self-assessments and resultant corrective actions were determined to be superior. The licensee's corrective action systems were effective in resolving equipment, design, and engineering procedural deficiencies. Root cause analyses performed for equipment deficiencies and for performance issues were also a strength. One area where improvements could be made is in the nonconformance report (NCR) process. The issues identified by the NRC in this process were minor, but the number of procedural issues found point to a potential difficulty in fully resolving NCRs.

The performance rating is Category 1 in this area.

V. PLANT SUPPORT

Overall performance in plant support continued to be superior, although a minor decline was noted in the security area.

Performance in the radiation protection area continued to be strong. Management oversight and program self-assessments improved during the SALP period. Although a comprehensive, aggressive ALARA program was being implemented, the collective radiation exposure for 1993-95 was about average when compared to industry performance. A substantial portion of the collective radiation exposure was accumulated during lengthy outages for both units. Exposures during nonoutage periods were minimal. Excellent training programs were effectively implemented. The radiation protection staff included a large number of individuals who had earned professional certification. Good programs were in place for surveys, monitoring, and the control of radioactive materials and contamination. Effective coordination, communications, and working relationships existed between the radiation protection department and other plant departments which contributed to the implementation of proper radiological work practices. Excellent performance was observed in the programs for control of radiological effluents, solid radioactive waste management, and transportation of radioactive materials. Appropriate attention was given to weaknesses identified in the areas of personnel monitoring, control of high radiation areas, use of protective clothing, and contamination controls. Outstanding performance was noted in

the secondary water chemistry and radio-chemistry areas, although additional attention was warranted to reduce iron transport to the secondary side of the steam generators.

Performance in the emergency preparedness area remained superior. An effective emergency preparedness program was maintained with local, state, and federal off-site support organizations. Emergency facilities, equipment, and supplies were maintained in a proper state of operational readiness. A strong on-site emergency response organization was in place which included well trained response personnel. Control room crew performance was excellent during the initial implementation of emergency preparedness walkthroughs using the control room simulator in a dynamic mode. Excellent performance was also observed during the 1995 annual emergency exercise, with few performance problems noted.

Overall performance in the security area remained strong. The security organization was well managed, innovative, and received excellent support by plant management. Excellent performance was noted in the areas of vital area barriers, alarm stations, communications systems, and search procedures. However, a minor performance decline occurred. This was indicated by the need for corrective actions to address problems related to the protection of safeguards information, protected area detection aids, plans and procedures, compensatory measures, access authorization, and the safeguards event log.

A strong fire protection program was maintained. The dedicated on-site fire department maintained an effective fire response capability. The licensee addressed fire system problems, including an inoperable fire sprinkler, inoperable fire dampers, spurious actuations of the deluge system and an open fire door. In addition, the licensee was actively improving the material condition and preservation of fire system components at the conclusion of the assessment period.

In general, good housekeeping was maintained throughout the plant, with more discrepancies noted during the lengthy outages. The implementation of "tidy Fridays" helped focus plant staff attention to maintaining improved housekeeping conditions. Housekeeping in the radiological controlled area was generally good throughout the assessment period.

Strong self-assessment and corrective actions programs were maintained in the plant support area. In particular, significant progress was made in the radiation protection area to develop an effective self-assessment and corrective action program resulting in comprehensive audits and surveillances.

The performance rating is Category 1 in this area.