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U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report Nos. 50-206/89-16, 50-361/89-16, 50-362/89-16

Docket Nos. 50-206, 50-361, 50-362

License Nos. DPR-13, NPF-10, NPF-15

Licensee: Southern California Edison Company

Facility Name: San Onofre Nuclear Generating Station Units 1, 2, 3

Inspection at: San Onofre, San Clemente, California

Inspection Conducted: June 26 - July 21, 1989

Inspectors:

J. F. Burdoin, Reactor Inspector, RV/DRS&P — Date Signed

K. E. Johnston, Resident Inspector (DCPP) — Date Signed

D. Coe, Resident Inspector (PVNGS) — Date Signed

* T. G. Dunning, NRR/Technical Specifications — 8/17/89 Date Signed

J. Russell, Radiation Specialist, RV/DRSS — Date Signed

Assisting Inspectors:
C. B. Ramsey, Reactor Inspector, RV/DRS&P
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Prepared By:

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Reactor Safety Branch, DRS&P, Region V

* Comments sent via 5520 dtd 8/17/89

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8/22/89
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J. F. Burdoin, Reactor Inspector, RV/DRS&P — 8-16-89 Date Signed

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Dennis F. Kirsch, Chief
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Summary:

Inspection during the period June 26 - July 21, 1989
(Report Nos. 50-206/89-16, 50-361/89-16, 50-362/89-16)

Areas Inspected: Special announced team inspection of maintenance program and implementation of related activities. The inspection team utilized NRC inspection procedure TI-2515/97 and related procedures referenced therein. A special review of emergency lighting was also included.

Safety Issue Management System Items:

None

Results:

General Conclusions and Specific Findings:

The team consensus was that the maintenance program at the San Onofre Nuclear Generating Station was exceptionally defined. While satisfactory implementation was in place, several areas could be strengthened, as detailed below.

There were areas where the licensee has been proactive in establishing improvements in the maintenance program. Particular note was taken of the initiatives to increase computerized data bases and access to records, develop Reliability Centered Maintenance and state of the art predictive and diagnostic techniques, and solicit and assess employee feedback on program performance.

However, some areas of weakness were identified, which reflected inattention to detail in either establishing or implementing the program:

1. MAINTENANCE PLANNING - Inattention to Detail

   EXAMPLES

   a. Ineffective Planning Walkdowns.
   b. Requirements Incorrectly Entered In Maintenance Order:
   c. Required Data Not Included In Work Plans
   d. Post-Maintenance Testing Inadequately Addressed In Work Plans
   e. Excessive Workloads Of Work Planners

2. MAINTENANCE WORK PERFORMANCE - Inattention to Detail

   EXAMPLES

   a. Failure To Perform Necessary Measurements/Verification
   b. Failure To Implement All Work Instruction Details
   c. Failure To Use Specified Temperature Instrument For Ambient Data
   d. Substitution Of Post-Maintenance Testing Details
   e. Improper Use Of Tools
   f. Inattention to Proper Worker Safety Procedures and Practices
   g. Inaccurate/Inadequate Documentation Of Work Performed

3. EQUIPMENT CONTROL: LONG-STANDING / CURRENT KNOWN INADEQUACIES

EXAMPLES

a. Not All Workers Notified of Changes To Equipment Clearance Status
b. Equipment Damage Involved Verbal Coordination Of Operable Equipment
c. Weak Control Of Multiple Work Orders On One Clearance.
d. Procedures - Unintegrated, Redundant, And Superseded.
e. Equipment Operated In Compromised Condition

4. CORRECTIVE ACTIONS AND ROOT CAUSE ANALYSES - Weakness

EXAMPLES

a. Weaknesses In Root Cause Determination And Corrective Action Scope
b. Inappropriate Work Priority And Timeliness
c. NCR Dispositions Incorrect or Insufficient For Implementation
d. Lack of Aggressive Quality Assurance Oversight

5. FSAR DISCREPANCIES

EXAMPLES

a. Appendix R changes, e.g. Lockout Of ECCS Actuation
b. Unit-3 LPSI Pump Seal Drain Piping Not Installed
c. Incorrect LPSI Pump Seal Leakage Data (Other ECCS)
d. Unit-1 Apparent Inadequate Illumination Levels

6. PROCUREMENT PROGRAM DISCREPANCIES

EXAMPLES

a. Receiving Inspection Weakness For Emergency Lighting Batteries

7. FINDINGS WHICH ARE NOT RELATED TO MAINTENANCE

EXAMPLES

a. Unavailability of Procedures at Designated Locations
b. Units-2/3 Emergency Lighting For Station Blackout Conditions

Safety Issue Management System Items

None inspected.

Significant Safety Matters

The inspection team did not identify any significant safety matters, such as would constitute inoperability of safety related equipment that would pose a significant threat to safety.

Violations Identified by the Team

1. Unit-1 Failure to perform specified calibration/testing of a containment spray isolation valve actuator. (APPENDIX A, Item 2.d.)

2. Unit-2 Failure to implement equipment status control (tagging) in accordance with procedures. (APPENDIX A, Item 3.)

3. Unit-1 inadequate bolt/nut thread engagement problems were not promptly identified and corrected. Unit-2/3 similar problems investigations were not properly documented. (APPENDIX A, Item 4.a.iv.)

Deviations Identified by the Team

1. Unit-3 LPSI pump seal leakage drain piping was not installed as indicated in the UFSAR. (APPENDIX A, Item 5.b.)

2. Unit-1 Emergency lighting illumination levels were not as indicated in the UFSAR, for 10 CFR 50 Appendix R compliance. (APPENDIX A, Item 5.d.)

Non-Cited Violations Identified by the Team

1. Failure to maintain emergency remote shutdown procedures in the locker specified by governing procedures. (APPENDIX A, Item 7.a.)

Unresolved Items

Unresolved items are matters about which more information is needed in order to determine whether they are acceptable items, violations, or deviations. An Unresolved Item, identified during this inspection, is discussed in APPENDIX A, Items 3, 4.a.v, 4.a.vi, and 7.b.

Open Items

Open Items are matters which involved licensee planned or in-progress actions at the time of the inspection, the results of which appear to warrant NRC future NRC inspection and review. Open Items identified during this inspection are discussed in APPENDIX A, Item 6.a.

Open Items Summary

During this inspection, 11 new items were opened.

Results of Review of Allegations

Allegation RV-89-A-0041 was investigated in conjunction with the overall assessment of the licensee's maintenance program and related equipment Work Authorization Request (WAR) process. The four elements of the allegation were substantiated and involved violation of NRC requirements for compliance with approved safety related procedures. (See APPENDIX C)

Management Meetings

The Team Leader met with senior plant management on July 20, 1989 to display and discuss the diagram representation of the results of the maintenance program evaluation. Issues identified during the inspection were conveyed in detail to the licensee's inspection coordinator, who discussed these with plant and corporate management prior to the formal exit meeting on July 21, 1989. During the exit meeting, the issues were briefly discussed. This was followed by a presentation of the maintenance diagram, to illustrate how the issues related to various elements of the maintenance program.

DETAILS

1. INSPECTION OBJECTIVES

The principal objective of this team inspection was to determine the effectiveness of the Southern California Edison integrated maintenance process at San Onofre, to assure that all components, systems, and structures are adequately maintained so that they are available to perform their intended functions, and that the maintenance processes at the facility provide for the prompt repair of plant components, systems, and structures as appropriate to their prescribed functions.

Several contributing objectives were addressed to focus the inspection:

a. Characterize the effectiveness of licensee maintenance program to avoid challenges to safety systems from transients initiated or made more severe by equipment failures due to maintenance weaknesses.

b. Assess effectiveness of quality verification organizations in contributing to the identification, solution, and prevention of safety significant technical problems and deficiencies in plant systems and operations. This includes the thresholds for management involvement in ensuring that identified deficiencies are responded to promptly and completely.

c. Highlight instances where licensee lack of self-critical evaluation led to either exacerbation of a problem or mis-identification of root cause.

d. Assess the status and responsiveness of licensee corrective actions for maintenance weaknesses identified via self-assessments, and/or previously identified by NRC inspectors.

e. Assess the emergency/essential lighting conformance to its design basis, including impact of changes and adequacy of surveillance and maintenance activities.

In addition to the above, the inspection team gathered information in the context of the overall maintenance assessment, specifically relating to equipment clearance control issues described in an allegation received while the team was engaged in on-site inspection-preparation activities (June 26 - 30, 1989)

2. INSPECTION APPROACH

The team attempted to find vulnerabilities in hardware, personnel, or program controls which could lead to plant transients if uncorrected. Emphasis was placed on equipment failures having root causes or elements arising from maintenance oversights or omissions.

a. Inspection Methodology

A diagram (MAINTENANCE TREE) and associated inspection guidance of NRC inspection procedure (TI-2515/97) was used to focus efforts of individual team members, and to assure that all potential contributors to plant problems were explored.

Following one-week of on site review of procedures, records and work in-progress, and interview of licensee staff, the resulting inspection data was reviewed in team meetings at the site. Inspection findings were considered relative to each block of the MAINTENANCE TREE, to identify maintenance control program aspects which may have contributed to discrepancies. Findings applicable to each block were discussed by the team, and a rating of program and implementation effectiveness arrived at by consensus. The individual block ratings were then averaged and adjusted qualitatively to an overall rating for each key block. In order to validate the team consensus conclusions, the team also considered existing records of licensee performance over the past 12 months, including NRC findings, licensee event reports, and results of licensee self-assessment efforts.

b. General Sample Selection

A plant specific PRA was not available for the San Onofre Units. However, generic PRA studies, such as NUREG-1050, identify the frontline systems for typical PWR reactors, and such systems were considered for inspection candidates. Equipment failure data of the NPRDS was also considered, along with consideration of topics of past team inspections. Additionally, recommendations of the NRC Senior Resident Inspector were considered.

With due consideration to all of these elements, the following systems were selected for the principal focus of this inspection:

* Low Pressure Safety Injection System (SIS)
* Main Feedwater System (Serves as SIS at San Onofre Unit-1)
* Instrument Air System (As it interfaces with solenoid valves)
* Emergency Lighting System

Special efforts were focused on the Emergency Lighting System, with the findings integrated into the assessment of the overall maintenance program. (See APPENDIX B)

Inspection of the equipment control aspects of the maintenance program were focused somewhat by consideration of data contained in an allegation (RV-89-A-0041) in this area. (See APPENDIX C)

3. SIGNIFICANT ISSUES IDENTIFIED DURING INSPECTION

The inspection team identified several regulatory compliance issues, in addition to observations of related program definition and implementation weaknesses. These items were grouped into general categories, and the details are discussed in APPENDIX A.

Acronyms used in this report, are defined in APPENDIX E.

4. ALLEGATIONS FOLLOW-UP

ATS RV-89-A0041: Control of equipment.

During the team on-site orientation and preparation, the resident inspector on June 29, 1989 was advised by an SCE employee that a complaint had been filed with CAL OSHA regarding a personnel hazard arising from improper control of equipment (Unit-2 containment spray pump) during a May 30, 1989 repair of the pump. The subject of equipment control is one of the specific areas addressed by the Maintenance Team Inspection, and the reported complaints were incorporated into the scope of the team inspection as one of the work samples to be reviewed. Findings regarding the complaints are specifically addressed in an APPENDIX C.

5. GENERAL INSPECTION FINDINGS - (Maintenance Assessment)

APPENDIX H of this report presents the team assessment of the licensee maintenance program, using the guidance of NRC inspection procedure TI-2515/97. Where applicable, the assessments presented in numbered subparagraphs of APPENDIX H refer to specific issues which have been discussed in detail in APPENDIX A.

APPENDIX I contains a marked diagram summarizing the team findings, as discussed with the licensee management representatives at the conclusion of the inspection. Near the end of the on site inspection, the team developed a consensus judgement of a rating of each assessment element, relative to perceived licensee performance in fulfilling maintenance program objectives of that element. A summary presentation of the team ratings of all maintenance program elements is provided on the diagram. The ratings are presented using color coding and scales, as described in the legend to the Inspection Tree. The ratings have been broken down into three parts, as follows:

Element Adequacy: A measure of how well the licensee maintenance program has described and documented the requirements of the element.

Green: The element was determined to be fully included in the licensee maintenance program.

Yellow: The element was determined to be adequately addressed in the licensee maintenance program.

Red: The element was determined to be missing or inadequately addressed in the licensee maintenance program.

Element Implementation: A measure of how well the licensee maintenance process has implemented the requirements of the element.

Green: The element was determined to be functioning and functioning adequately.

Yellow: The element was determined to be in place, but could be strengthened.

Red: The element was determined to be missing or inadequate.

Composite Element Rating: Element Adequacy and Element Implementation ratings of individual level 4 blocks of the tree were combined to reflect a composite rating for the level 2 and 3 blocks (Blocks I, II, III, and 1.0 through 8.0) and for the overall rating of the maintenance program:

Good: More than minimal efforts have been made in this area, and this area has desirable qualities with only a few minor areas requiring improvement.

Satisfactory: Applicable requirements of this element have been developed, documented and effectively implemented.

Areas requiring improvement are approximately offset by better performance in other areas.

Poor: Inadequate or no effort has been made in this specific area.

The handling of color coding of Section I of the Inspection Tree was an exception to the above procedure. Section I deals with historic data and plant appearances, for which a two part (program and implementation) breakdown was not appropriate. For Section I blocks, a single color code was assigned, representing adequacy of physical plant and its operational history; i.e. functioning well (Green); adequate (Yellow); inadequate (red).

In addition to the color code characterization of the individual and overall block ratings, the team also gauged the degree of conformance with the evaluation criteria, (a composite of both the program definition and implementation aspects of each block); this was represented by a mark in the sliding scale below each level 4 block of the tree. These scaled ratings were compiled in histogram form to arrive at similar relative ratings for the level 2 and 3 blocks, and the level 1 overall maintenance program rating.

The subparagraphs of APPENDIX H are numbered to correspond to individual blocks of the Inspection Tree, and summarize the basis for individual ratings discussed above.

APPENDIX A

SIGNIFICANT ISSUES IDENTIFIED DURING THE INSPECTION

The inspection team identified several regulatory compliance issues and other observations which appeared to be weaknesses in the maintenance program and/or its implementation. These items were grouped into general categories as discussed below, and were considered during the rating process documented in APPENDIX H of this report.

1. MAINTENANCE PLANNING - Inattention to Detail

Based upon observations of in-progress maintenance and review of closed maintenance orders for maintenance completed within the past year, the team concluded that planning weaknesses existed that, if permitted to continue, could develop into safety significant problems. The following were representative examples that highlighted the types of problems that were observed by the team.

a. Ineffective Planning Walkdowns

i. MO 89070727: Replace a cracked pump block on the Unit-2 Charging Pump MP192. An ineffective planning walkdown/review failed to recognize existing work interferences, in spite of the fact that similar replacements of cracked block assemblies on various of six charging pumps had occurred seven times previously, and the current pump configuration was essentially the same on at least three of the pumps.

The MO step that removed the failed block stated: "2. As directed by maintenance supervision remove the cracked block from the crankcase, and transport it to the laydown area. (Ref Support MO 89070744) Bag and tag all bolting (some of which is ASME) to prevent loss." (The referenced MO was for rigging of the pump block.)

Soon after starting disassembly, the craft performing the removal work noted that flange bolts on the downstream pump spool piece could not be removed without the removal of the spool piece itself. It was then noted that the spool piece could not be removed without the removal of a vibration transducer attached to the spool piece, and further, that conduit protecting the transducer cable ran in front of the pump block such that the block could not be removed without removal of the conduit. Work was stopped while changes were made to the existing MO, and while additional MOs were generated for support craft to remove interferences.

ii. MO 89050408: Replace Unit-3 Emergency Diesel lube oil Y-strainer; MO 89042694: Replace the air start motor lubricator with an upgraded model. An ineffective planning walkdown/review failed to recognize work interference.

In both cases, modifications to the MOs were required after work start because interferences were encountered that had not previously been considered. In each case, the interferences were obvious and should have been accounted for in the MO.

iii. MO 89070728: Replaced broken actuator mounting bolts on air operated valve 2HCV6539, CCW Minimum Flow to Critical Loop B. Ineffective planning walkdown/review failed to recognize the limited scope of work required.

On receipt of replacement bolts from the vendor, it was noted that the bolts were too long. Due to time constraints of an LCO, the decision was made to cannibalize the equivalent bolts from the same type Unit-3 valve (3HCV6538) which was not under LCO constraints. MO 89070977 was written to disassemble the actuator from 3HCV6538 and remove the bolts to 2HCV6539. The craft, on arrival at the job site to remove the bolts from 3HCV6538, expressed doubt and concern about why planning decided to completely remove (and re-install later) the actuator from the valve. The craft suggested simply exchanging the bolts one for one with temporary bolts, until proper material could be received, and thus avoid the unnecessary time consuming total removal and replacement of the actuator. The job foreman solicited an MO change (quickly accomplished), and the bolts were exchanged in five minutes.

iv. MO 89062236: Replacement of the fuel oil duplex filter due to high differential pressure on the Unit-1, #1 Emergency Diesel Generator (Equipment ID S1-DFS-BS-935). Ineffective planning walkdown/review failed to recognize the extent of Foreign Material Exclusion (FME) controls warranted for the work.

The planner had specified FME Option 3 in the MO, which included strict tool, personnel accountability, and physical boundaries. The craft proceeded with disassembly of the fuel oil filter using FME Option 2, until questioned by the NRC inspector. When requested to approve the change to Option 2, the planner had no objection and approved the change.

v. MO 89070728: Replaced broken actuator mounting bolts on air operated valve 2HCV6539, CCW Minimum Flow to Critical Loop B. Ineffective planning walkdown/review failed to recognize and addressed the subject of leaking packing.

During the stroke testing of valve 2HCV6539, a packing leak existed on the valve; this was indicative of the probable root cause failure of the actuator bolts, based on evidence of corrosion at the actuator to valve interface. Neither the MO nor the associated NCR 2-2759 (written to describe broken bolts as sheared off) addressed the subject of leaking packing; thus the root cause of the failed bolts might not have been corrected. (The NRC inspector pointed out the condition to the job-site foreman for preparation of the appropriate material deficiency report.)

vi. Maintenance Procedure S0123-I-1.7, para. 6.4.4.2, directed the planners to perform reviews of the maintenance problem, including visiting the equipment location and contacting the maintenance requester. Planners and planning reviewers indicated that they did not have adequate time available to perform detailed reviews, including walkdowns, of each job. Thus, it was not uncommon to have the above types of problems occurring frequently.

b. Requirements Incorrectly Entered In Maintenance Order

In-progress and closed maintenance orders were frequently not accurate, particularly in the "Requirements" portion of the MO. The following examples highlighted these types of problems.

i. MO 89041303: Implemented the troubleshooting of SI Tank Outlet Valve 3HV9350 (to RCS Loop 1B), required by the corrective action disposition of NCR 3-2384. Requirements of the NCR were incorrectly translated into the MO.

The Mode Restraint listed in the NCR was, "3 above 715 psig", meaning in Hot Standby not above primary pressure of 715 psig. MO 89041303 listed the following requirements, which were incorrect:

"	REP Req'd?	- N	No. - N/A
	Plant Mode Req'd	- A	
	Mode Restraint	- A	
	Effect on Unit	- N	
	Functional Tests Req'd?	- N	"

The valve was physically located in the containment as described on the MO (via the computer equipment data base), thus an REP was obviously required to perform work. The plant mode and restraint were not correctly transferred from the NCR to the MO; "A" meant "No limitation; the repair can be made at any time." The "Effect on Unit" listed as "N" was not correct; the non-operability of the valve was actually restraining a startup of the unit at the time of the discovery of failure. The listing of "Functional Tests Req'd?" as "N" (no or none) was incorrect; at the time, the extent of functional testing may not have been totally known, but as a minimum, some functional testing was required following the corrective action appropriate for the troubleshooting.

Also, the problem description on this MO was listed as "Need To Perform MOVATS." This problem description was not accurate in that previous mechanical troubleshooting (done under MO 89041195) had clearly isolated the problem to electrical in nature. Thus a more appropriate problem description would have been, "Perform electrical troubleshooting of failed motor operator". This is considered relevant because the problem description on MOs was the starting point for many licensee

failure and trending reports; if the equipment problem was not accurately described, the failure could go unnoticed.

c. Required Data Not Included In Work Plans

The data required by governing administrative procedure SO123-I-1.7 was not always properly included in each Maintenance Order, as illustrated by the following examples:

i. MO 89041195: Investigation of the failure of SI Tank Outlet Valve 3HV9350 (to RCS Loop 1B) to stroke on actuation from the control room. The MO did not specify the required "Tailboard" briefing, nor all needed acceptance criteria.

The investigative MO did not specify, as a part of the Work Plan, a "Tailboard" pre-job planning meeting, as required by SO123-I-1.7, para. 1.F.2.1.6, Attachment 6, p. 63 of 76.

Also, the MO required manually stroking the valve in accordance with the disposition of the associated NCR 3-2384, but did not specify the maximum torque that could be applied to the manual operator. Attachment 6, para. L.1.1.7, p. 67 of 76, SO123-I-1.7, required a "High Level of Detail" for "equipment or system investigations."

ii. MO 89041303: Electrical troubleshooting of the motor operator of 3HV9350 after the valve had been determined to operate correctly, mechanically. The correct work procedures were not invoked by the MO.

The MO Step 5.C. required, "Rework the Limitorque operator IAW the references using in-kind parts (as required). Refer to SO123-I-4.59, CS-E03, SO123-I-6.7 and SO123- I-6.8." The applicable sections of SO123-I-6.8 (to be used in the repair work) were not specified, as required by SO123- I-1.7, para. 1.E., Attachment 6, p. 62 of 76. Also, SO123-I-6.7 was not applicable to the type SB-1 valve actuator being worked under the MO.

iii. MO 89041436: Remove the motor actuator from valve 3HV9360 for inspection of the motor pinion gear. The MO did not specify staking of set-screws, as required by approved procedures.

NCR 3-2394, generated from MO 89041426, was written because the pinion gear was found in a "reversed configuration". The NCR directed the installation be made in accordance with approved procedure SO123-I-6.8. MO 890401436 was then written to correct the deficient condition of reversed configuration. In Step 2. the MO stated, "Restake the key."; however, it was silent on staking the set-screw holding the key in place. (Procedure SO123-I-6.8, Para. 6.4.27, required tightening and staking the set-screw; the craft staked the key and the set screw.) The MO could have been written with more consistency.

iv. MO 89041436: See above. The "Material Requirements" section described a valve motor-actuator as "2.6 HP, elec"; the actuator was actually 5.3 HP.

v. MO 89041362: Remove and inspect the motor pinion gear of the actuator of valve 3HV9370, to ensure the pinion gear key and set screw were staked. The work instructions, and possibly the "Tailboard", were not adequate for the tasks assigned to the craft.

Valve 3HV9370 was the third SI Tank Isolation Valve actuator being worked on for problems associated with the motor pinion gear. The Work Plan of the MO referenced drawing 32661, an elementary wiring diagram that had nothing to do with the actuator problem for which the maintenance was being performed; no other references useful to correction of the problem were specified. The problem description and the Work Plan did not describe or mention the reversed configuration of the pinion gear itself, that had been the subject of the previous NCRs and MOs. (As a consequence, three electrical craft persons spent three hours performing the following "Work Performed" actions: "Removed motor. Key stock was not staked. Staked key stock. Could not determine if the pinion set screw was installed or not." A subsequent crew determined that the gear pinion was installed backwards, with the set screw being mashed by the driven gear such that it was difficult to see by an un-alerted person. An NCR and MO were generated to correct the problem (NCR 3-2393, MO 89041430).

vi. MO 89070270: Disassembly and inspection of Unit-1 "A" Reactor Coolant Pump Motor lower bearing. Needed instructions and reference sketches/drawings were not provided with the MO, and some needed instructions were not included for the crafts.

The Note at step 6.8.44 directed the procedure user to "Refer to Attachment 2", and "Install washer (72), nut (71), and tighten nut (71)". However, Attachment 2 did not picture these parts, nor did any other Attachment in the procedure.

No subsequent step in the procedure directed the craft to properly lock one of the tabs of the pantleg-type lockwasher into the lock nut. (Although the procedure was inadequate, the craft locked the washer correctly. However, the craft did not note the procedural inadequacy because they were not referring to the procedure).

The radial alignment of the inspection holes over the seal gap was not correct for all holes, thus the entire motor assembly had to be rotated relative to the motor cage to permit making the gap check. This condition was not recognized by the procedure.

The disassembly section of the procedure (Section 6.4.1 through 6.4.1.3) was explicit about how many readings (four) to take on the gap. The re-assembly procedure (as written above) was not explicit.

Step 6.8.47 required, "Install plugs (73), per matchmarks, and tighten."; however, the MO did not require that the plugs be staked. (The crafts staked the plugs during work performance, since they were apparently aware that staking of the plugs was necessary since on one occasion in the past a plug had backed out during pump operation with significant, adverse effects.)

The Work Plan step 08 stated, "(Optional) If directed, perform anti-reverse rotation device inspection (& Overhaul) IAW Section 6.5." The Work Plan should have explicitly directed the inspection of the anti-reverse shock absorber per para. 6.5.1 of SO1-I-8.164, and if adverse conditions were found, initiation of an NCR.

d. Post-Maintenance Testing Inadequately Addressed In Work Plans

i. MO 89041303: Electrical troubleshooting of the motor operator of valve 3HV9350, after the valve had been determined to operate correctly mechanically. Post-maintenance testing documentation was not completed as required.

The data records were not completed to reflect testing in accordance with procedure SO123-I-6.8, para. 6.10. (However, records did show that the craft performed MOVATS testing of the actuator, and the Operations group did perform a functional test upon clearing the Work Authorization on the valve, thereby satisfying the significant requirements of the specified testing procedure.)

ii. MO 89041426: Removed the motor actuator for inspection of the motor pinion gear in 3HV9360. Post maintenance testing requirements were not specified in the MO, as required by procedures SO123-I-1.7 (MO preparation) and SO123-I-1.25, (Maintenance Verification Testing).

NCR 322-2394, generated from this MO, was written because the pinion gear was found in a "reversed configuration". MO 890401436 was then written to correct the deficient condition of reversed configuration. Neither MO 89041426 nor MO 89041436 specified functional testing, nor did they invoke any testing procedure external to the body of the MO. (The inspection team noted that the Operations group did perform an operational test of the valve upon clearing the Work Authorization.)

Discussions with the licensee indicated that it was not uncommon for the definition of test requirements to default to the Operations group upon clearing the Work Authorization. This would appear to be contrary to the requirements of

S0123-I-1.7, (and S0123-I-1.25 para. 6.1.1 that states that the Test Required Section of the MO should be the controlling document for all Maintenance Verification Testing.) Maintenance Planner Responsibilities were clearly defined in para. 6.2., which required the planners to include reference to tests within component repair procedures if possible, and if not available, to use checklists to specify appropriate testing in the MO. These requirements were not implemented, however, the team noted no instances where Operations failed to properly prescribe appropriate PMT when not specified by Planning. Nevertheless, it appeared that Operations should be used as a final check on the adequacy of prescribed PMT by Planning, not as the only group making the decision.

iii. MO 89070728: Replaced broken actuator-to-valve bolts on 2HCV6539, CCW Minimum Flow to Critical Loop B. The post maintenance testing instructions did not include sufficient acceptance criteria.

The PMT following the removal and installation of the air-operated actuator was embedded within the MO, and consisted of the following steps:

" 13. Release the clearance. Then have operations stroke the valve to ensure proper operation.
QC: Witness proper operations (Final Only - After adjustment, as req'd.)
QC(W)_____ Date:_____
14. If required, the electricians to adjust the limit switches, or valve stroke.
Performed by_____Date:_____ "

The limit switches were not connected electrically, and their proper operation was not checked nor specified by the work plan. Comments were not included in the work plan to assist the craft in determining that non-connected switches' were appropriate, or that it was appropriate to not check the switches.

The MO did not provide acceptance criteria associated with a requirement to "...ensure proper operation." This caused the plant equipment operator to have to refer to the proper surveillance procedure to determine that the maximum permissible stroke time was ten seconds. Additionally, on stroking the valve open, it was noted to open approximately 78-degrees, although the attached valve position indicator (plate under a pointer) had stroke range to 90-degrees. Although the valve was a butterfly valve, and probably had internal stops that prevented it from opening 90-degrees, the foreman directed the craft to "adjust" the actuator mechanism attachment point (on the actuator arm) to change the length of the pivot arm (and thus the valve stroke), without reference to any technical information. However, the attachment point was not able to be "adjusted", because the pivot device was

staked in place on the actuator arm. The proper adjustment device was a turnbuckle inside the rubber boot under the air operator; this was not discovered by the craft, thus no adjustments were able to be made. After an hour of five persons attempting to "discover" what to do, the job was stopped in order to seek technical resolution. It appeared that specification of appropriate acceptance criteria would have avoided the risk of the craft making an improper or perhaps unnecessary adjustment. The planner should also have included instructions to make adjustments in accordance with an appropriate reference.

e. Excessive Workloads Of Work Planners

The planning discrepancies noted above appeared to be related or relatable to the ability of the Work Planners to perform their duties as prescribed by governing administrative procedures. One element of such ability to perform involved the large workloads handled by the Work Planners, described as follows:

Maintenance Procedure SO123-I-1.7, Maintenance Order Preparation, Use, and Scheduling, para. 6.4.4.2, directed the planners to perform reviews of the maintenance problem, including visiting the equipment location and contacting the maintenance requester, in performing their planning functions. Discussions with planners and planning reviewers indicated that they did not have adequate time available to perform detailed reviews, including walkdowns, for each job.

Each planner on average was noted to be responsible for approximately two hundred Maintenance Orders on a daily basis that were in Categories 15 (into his in-basket for planning) through 70 (Work-in-progress). It was also noted that the following approximate percentage breakdown existed for the above categories:

15%	Preventive Maintenance	(repetitive, therefore possibly routine)
30%	Category 15 - 18	(in the planners hands for action)
40%	Category 20 - 60	(in review or hold cycle)
30%	Category 70	(work in progress, could come back to planner any time for further action)

This situation appeared to be a potential safety problem, since adequate craft performance is dependent on the adequacy of their instructions and training.

2. MAINTENANCE WORK PERFORMANCE - Inattention to Detail

For in process work observed, the crafts did not appear to refer to the available governing procedures, and were inattentive to details of work performance and associated documentation, sometimes resulting in errors or omissions; examples are described below.

a. Failure To Perform Necessary Measurements/Verification

MO 89070270: Repair the Unit-1 "A" Reactor Coolant Pump Motor upper radial and thrust bearings. Maximum seal gap clearance was not determined as specified.

Procedure SO1-I-8.164 (step 6.8.46) required, "Measure seal (65) gap, through the holes provided in the flywheel (70) ..... ACCEPTANCE CRITERIA: 0.012 - 0.015 inches."

The craft used only a 0.012 feeler gauge to determine the minimum gap, and did not use a 0.016 inch feeler gauge to assure that the maximum permissible gap was not exceeded. (The NRC inspector requested the maximum gap check, and the craft complied and found the gap acceptable).

b. Failure To Implement All Work Instruction Details

MO 89070270: Repair the Unit-1 "A" Reactor Coolant Pump Motor upper radial and thrust bearings.

i. Procedure SO1-I-8.164 (step 6.8.43.1) required "Install shaft keys (96) per matchmarks." (Attachment 2, Section E-E, was applicable).

The shaft keys were not installed until after the flywheel was "home". In addition, the shaft keys were not installed per matchmarks, but were simply driven into the keyway with a drift until flush with the top of the flywheel.

ii. Procedure SO1-I-8.164 (steps 6.8.43.4 through .12) required the use of a flywheel jack to properly home the flywheel.

The jack was not used; rather the craft simply "jiggled" the flywheel into place with body weight, and then used the flywheel lock nut to tighten the 7500 lb. flywheel into place. The licensee later went back and performed the procedural steps that had been omitted.

iii. Procedure SO1-I-8.164 (step 6.8.47) required, "Install plugs (73), per matchmarks, and tighten."

The plugs were not installed per any matchmarks, and in addition to tightening, were staked to prevent their loosening. (Staking of the plugs was necessary since on one occasion in the past, a plug had backed out during pump operation with significant, adverse effects. The team therefore considered the procedure and crew performance to be inadequate.)

The craft did not refer to any of the above steps of the procedure during any of the assembly evolution. No mention was made of any of the procedural deviations or procedural changes required

although a Foreman grade craft person supervised the entire evolution.

c. Failure To Use Specified Temperature Instrument For Ambient Data

MO 89031470: Replacement of relief valve, S1-GNI-PSV-311, the Bank B Instrument Air/N2 Header Relief Valve, because it leaked through. Specific MO instructions, to use a calibrated instrument for ambient temperature recording, were not complied with by the craft.

The replacement valve was a Quality Class Safety valve. The MO included the Pressure Test Report (PTR) since the valve was ASME VIII, which stated in Block 13., Special Instructions / Precautions, that the required Test Temperature was "Ambient", and "Read temp. w/ Hand Held Calibrated thermo indicator." The test performance data, Block 21. stated the Actual Temperature to be "Ambient", and the Gauge I.D. as "N/A". In other words, notwithstanding the requirements of the ACE and Cognizant Engineer to measure the test temperature as "ambient", the craft person performing the test and the QC inspector witnessing the test failed to implement the requirements of the Pressure Test Report. The test temperature should have been specified as a range equivalent to ambient to take the subjectiveness out of the test procedure, and that the craft should have measured the temperature as directed by the PTR.

d. Failure To Perform Specified Post-Maintenance Calibration Testing

MO 87102901000: Repetitive Maintenance # 91060590014, for the Unit-1 containment spray header, inside containment, isolation valve actuator S1-CRS-CV-82-ACT. Boiler and Condenser Mechanics failed to perform the specific calibration and post-maintenance testing on February 25, 1988.

MO 87102901000, in the "Tests Required" section, specified that restoration, post maintenance testing, and return to service be conducted in accordance with procedures SO1-I-6.59 and SO123-II-9.37. The corresponding work completion signature blocks had not been signed on the completed MO; the work performed section of the MO contained no indication of any "calibration" performed; and there was no record in the MO of the use of calibrated instrumentation, which would be needed to calibrate the actuator.

Although the "Work Performed" section of the MOs described that the air supply solenoid was absent and the valve actuator air supply could not be reassembled (MOs 87090693000, 001, and 002), these conditions would not have interfered with the ability to perform the calibration required by SO123-II-9.37.

Procedure SO123-II-9.37, "Control Valve Calibration" step 5.1 stated that "Instrumentation Calibration Data Card(s) (ICDC) shall serve as the Data Record for recording work performed." The ICDC for valve CV-82 showed "calibrations" performed in 1986, but none in 1988.

However, the operability of the valve is not in question, since prior to its return from service a stroke test was performed in accordance with MO 87090693002 (following the replacement of the solenoid). Therefore, the stroke test assured that the valve would open and close under operating conditions, in lieu of the specified valve calibration data demonstrating what pressure is required to close the valve and the preload pressure. Nonetheless, the lack of performance of required post maintenance testing, without written justification and ability of follow-up reviews to find the error, appears to be a weakness an inattention to detail and a violation of approved procedures required by Technical Specification 6.8.1.c. (Violation 206/89-16-01)

e. Improper Use Of Tools

MO 89063008: Surveillance testing was performed for the Unit-1 containment isolation channels by isolating each containment pressure transmitter and injecting a pneumatic signal via its test valve. In this process, a cap was removed from the inlet to the test valve without applying a counter torque to the valve; this resulted in the loosening of the Swagelock compression fitting on the transmitter side of the test valve. Integrity of these fittings is essential to the integrity of the containment barrier and, because they are not subjected to local leak rate testing, their integrity is only confirmed during an overall leak test of containment. Because the surveillance tests are performed monthly, there is an higher possibility of having loose fittings when caps are removed from test valves by the improper use tools.

f. Inattention to Proper Worker Safety Procedures and Practices

i. MO 89070270: Repair Unit-1 "A" Reactor Coolant Pump Motor (Equipment ID: S1-RCS-MG-2A) upper radial and thrust bearings. During the installation of the 7,500 lb. flywheel, several work practices were noted that were not consistent with the licensee's procedures.

A lifting device was used to suspend the flywheel from the crane. An auxiliary chain fall was then used in parallel with one leg of the lifting device main supports to permit leveling of the flywheel, accommodating non-equal length device supports. An eye-bolt was used as the attach point to the lifting device for one end of the chain fall. The inspection team noted that the eye-bolt was not fully engaged (lacked approximately a half inch), contrary to the SCE Rigging Standards Manual (Revised July 1984), Figure 74, page 23.

The RCP motor was being worked in an elevated position, with the base of the motor in its support fixture on the operating floor of containment. Scaffolding was erected around the top of the motor to permit the craft access, some fifteen feet off the operating floor. The scaffolding was tagged as not meeting OSHA requirements (railing not high enough), and thus safety belts were required for use when on the scaffolding.

On several occasions craft workers did not use safety belts when on the scaffolding.

Approved head protection (hard hats) was provided for use in containment, and Safety Procedure SO123-XVI-8.0, para. 6.2.2, required their use around potentially falling objects, at or near cranes and/or suspended loads. Several workers were noted to be working in the environment described by the procedure without hardhats.

Safety glasses (or equivalent) were prescribed by Safety Procedure SO123-XVI-7.0, Attachment 8.1, Required Eye Protection Table, "Anytime Striking Metal Against Metal.....". At least one worker involved with tightening the flywheel lock nut with a hammer and drift was observed not wearing eye protection.

During the lift of the RCP flywheel onto the motor shaft, the flywheel passed over three persons standing on top of the scaffolding described above in transit to the centerline of the RCP shaft. There was no observable need for the craft to be so positioned, i.e., adequate room was available on the scaffolding to stand to the side so that the load did not pass over them. Maintenance Procedure SO123-I- 1.13 included a Caution at para. 6.1.2 that stated, "In accordance with good rigging practice, no load, regardless of weight, should be passed over any equipment or personnel if it can be avoided."

After the flywheel was properly positioned onto the RCP motor shaft, the signal man for the crane operator permitted a craft person to obstruct his vision of the area under the flywheel lifting device. Without clearing his area of vision, the signal man ordered the crane hook lowered, thereby lowering the flywheel lifting device onto a craft person working under the device at the top of the motor shaft. Third person(s) intervened to stop the device from lowering more. No injuries were sustained.

ii. MO 89070727: Replace the cracked pump block on Unit-2 Charging Pump MP192. During the sequence of removal of interferences and attachments containing primary water associated with the pump, radiological practices were noted that could be strengthened.

On loosening the pump to suction and discharge spool piece flanges, water drainage began which the craft permitted to run into the foundation berm surrounding the pump installation. As the water continued to run, it became obvious that a large quantity was trapped in the piping, and that a large puddle was going to collect within the berm. The HP monitor obtained large quantities of absorbent paper which was used to sop up the draining water. This method was used as opposed to taping a collection bag under the flange to catch the drainage, then once drained, the water emptied into the nearby, contaminated

floor drain; this would have reduced the risk of the worker stepping into the puddle or into the draining stream, and would have significantly reduced the amount of waste generation. In a similar situation, the craft disconnected an instrument tubing line, but did not tape a small bag with absorbent material onto the end of the line. As the worker loosened the other end of the six foot length of tubing, the vent path caused the line to drain, and the motion of loosening caused the draining coolant to spatter about the work area.

The licensee advised the team that the entire work area was considered a contaminated area, and that upon completion of the maintenance activity, the entire area would be decontaminated. (However, the team noted that preventive measures would have reduced the potential for personnel contamination, would have reduced waste generation, and would have reduced subsequent clean-up time and personnel exposure.) Such radiological practices could be improved.

g. Inaccurate/Inadequate Documentation Of Work Performed

MO 89041303: Electrical troubleshooting of the motor operator of 3HV9350 after the valve had been determined to operate correctly, mechanically. The Work Plan called for performing MOVATS testing of the valve, and Step 5.A. required QC verification of valve current and thrust measurements. The hand-written entry at 5.A. stated, "Valve did not work. No current." In fact, the motor actuator ran at a no-load current value of 4.6 Amps. The incorrect entry/conclusion could have led to an incorrect hypothesis regarding the type of failure.

S0123-I-6.8, "Actuators - Limitorque Models SMB-0 through SMB-4 and SB-0 through SB-4, Disassembly, Inspection, Repair and Assembly", para. 5.0 Checklist, required the use of Maintenance Data Record Form, Attachment 18, and the MO to record numerous conditions of the maintenance performed, including signatures for the accomplishment and verification of some special activities (e.g., para. 6.4.20, landing of leads, and para. 6.4.27, motor pinion installation). The form was not used as required by S0123-I-6.8, thus some completion and verification activities were not performed and/or documented.

3. EQUIPMENT CONTROL LONG-STANDING / CURRENT KNOWN INADEQUACIES

The SCE San Onofre Work Authorization (Equipment Clearance) process has had a history of ineffectiveness and breakdowns of the intended controls. Details of this poor performance are discussed in APPENDIX C of this report; the Unit-2 procedure implementation discrepancies, described in part 3.e of APPENDIX C, constitute an apparent violation of Technical Specification 6.8.1. (Violation 361/89-16-02)

The Work Authorization process addresses principally industrial safety of plant personnel, although nuclear safety aspects could be encountered

where the potential exists for damage to operating or operable systems or equipment. The demonstrated weakness in the SCE Work Authorization process could lead to future violation of NRC requirements.

Closely related to the above concern, is the manner in which the SCE decisions on equipment operability have been made (failure to accurately assess equipment operability); this has been the subject of NRC major enforcement actions and topics over the past year, and a continuing NRC concern. Licensee efforts to improve this area will be reviewed during future inspections. (Unresolved Item 50-206/361/362-89-16-03)

The following weaknesses/examples were identified and/or reviewed during this inspection (discussed in detail in APPENDIX C):

a. Not All Workers Notified of Changes To Equipment Clearance Status

The licensee records showed various cases of equipment being released for operation or test without prior notification of all personnel who may be working on, or otherwise involved with the equipment.

A recent example involved a mechanic who was about to commence work on a containment spray pump, at a time that operations staff were about to activate the pump motor to test direction of rotation.

b. Equipment Damage Involved Verbal Coordination Of Operable Equipment

At least one event has occurred where equipment was damaged due to efforts to avoid declaring it inoperable while work was being performed on the equipment. A recent example was the non-safety-related radwaste holding tank, which collapsed when equipment operators drained the tank while its vent was covered.

c. Weak Control Of Multiple Work Orders On One Clearance.

There were inconsistencies and ambiguities in the procedures governing multiple crafts working under a single equipment clearance tag, and cases of breakdown in the intended master control.

d. Procedures - Unintegrated, Redundant, And Superseded.

As of July 20, 1989, procedure SO123-XV-10.0 "Multiple Work Items Against a Single Work Authorization", Revision 0 (Temporary Change Notice dated August 28, 1987) still had references to procedures SO23-0-13 and SO1-14-34, which had been superseded July 12, 1988. The above is indicative of a lack of use or review of procedure SO123-XV-10.0, since one year had elapsed with no request being made to update the reference procedures.

e. Equipment Operated In Compromised Condition

A redundant channel of the reactor protection system was declared operable while a cable connector was not secured in accordance with

the qualified design, although the cable may have been temporarily secured.

Channel functional tests were performed to verify the operability of Unit-3 Channel D of the Reactor Plant Protection System (PPS). Steps 6.28 and 6.29 of the test procedure SO23-II-1.1.4, involving the Low Pressurizer-Pressure Setpoint Reset and Low Steam Generator Pressure Setpoint Reset, could not be successfully completed due to a loose instrument connector. The source of the problem was faulty retaining screws that ensure that the plug remains in the socket of the connector. An NCR to resolve this problem was issued and noted that once the connector was properly mated (the) problem was corrected. Generating Station Log entry No. 259057 noted that the connector was secured with temporary supports; however, there was no authorization to perform maintenance on the system in the MO used to investigate the problem, nor did the work done section of the MO indicate that any corrective maintenance had been performed to secure the connector. The channel was then declared operable, i.e. the failed surveillance steps were successfully completed and the WA was released to operations with the applicable sections checked to note that the system was "OK for service" and "OK for OPERABLE".

Technical Specification 3.3.2.b allowed continued plant operation, with one of the four PPS Pressurizer-Pressure Low channels inoperable. Accordingly, there appeared to be little motivation for retaining the questionable Channel D in service until a disposition of the NCR 3-2294 for the connector problem was made one month later. The documented justification and safety evaluation for this action were also poor, as described in the following section of this APPENDIX.

4. CORRECTIVE ACTIONS AND ROOT CAUSE ANALYSES - Weakness

a. Weaknesses In Root Cause Determination And Corrective Action Scope

There appeared to be inattention to detail and lack of aggressiveness in determination of root causes of identified discrepancies, and in the scope of follow-up investigation and corrective action.

i. Excessive Default to "Other", as the NCR Apparent Cause

For NCRs related to the safety injection and feedwater systems of all units for one year (a total of 132), it was found that 67% (89 NCRs) had "other" marked as the apparent cause. In most cases, where the determination was "other," the cause determinations were found to be superficial with only a few words of description such as "normal wear" or "design inadequate" (examples; NCRs SO1-P-6867, SO1-P-7052, SO1-P-6757, SO1-P-7105). As a result, in many cases the corrective actions taken addressed the deficiency's symptoms and not the root causes (see item 4.b., below).

The first quarter 1988 SCE quarterly trend report identified that the "other" category was used extensively and proposed that its use be cut to 20%. However, the subsequent fourth quarter 1988 trend report for the Nuclear Oversight Organization Manager showed that 65% of the NCRs closed in that quarter were coded "other."

Additionally, an SCE QA review had determined that of the "other" determinations, 34% (88 NCRs) should have been categorized differently and 29% (74 NCRs) were instances of "design inadequate." However, the QA conclusions and recommendations suggested only that more cause codes be added so that better trending could be performed. The report failed to address why so many NCRs had been categorized wrong and if there was a generic problem of design inadequacy (see below).

ii. Solenoid Valve NCR Apparent Cause Determination Not Explicit

The NCR "Apparent Cause" determinations were not always explicit; e.g. NCR SO1-P-6660 Rev.4, addressed the failure of target rock solenoid valve S1-SI-SV-2900; it stated that the apparent cause was "personnel error", but it did not explain the nature/source of the personnel error. The cognizant engineer, when asked, stated that he felt that someone had inadvertently stepped on the valve.

iii. Corrective Actions Directed at Problem Symptoms

Many NCR corrective actions addressed the symptoms of problems as opposed to root cause problems.

(a) A number of NCRs (examples, SO1-P-6715, SO1-P-7059, SO1-P-6665) described the corrective action to prevent recurrence simply as "See Block 21", referring to the NCR "Disposition" block which describes rework, repair, accept as is, etc. Some NCRs described the apparent cause to be design or drawing error, with the corrective action limited to correcting the design or drawing without consideration of how the design or drawing came to be in error (examples SO1-P-7272, 3-2269, SO1-P-6751).

iv. Corrective Actions Incomplete For Bolt Thread-Engagement Issue

Unit-1 NCR SO1-P-7294, (dated June 28, 1989), addressed inadequate thread engagement on a flange for the Unit-1 east SI pump; it identified the apparent cause as "Other: support plate was added to flange under lower 2 bolts." The NCR also referenced its "disposition" as the "corrective action"; i.e. "Remove bolts one at a time and replace with 1/2" longer 'in kind' bolts or studs and nuts of equivalent length." This analysis did not address when and how the flange was assembled with inadequate thread engagement, nor what corrective actions were needed to assess and correct the generic implications. While it can be argued that one or two examples of inadequate

thread engagement does not warrant a complete walkdown of all systems, there was no indication at the time of the inspection that any licensee organization performed deficiency trending which could have identified an inadequate thread engagement issue (see below).

During this inspection, an NRC inspector again identified a case of incomplete bolt to nut thread engagement (Unit-1 safety injection pump outboard mechanical seal; two nut-threads visible). The issue of thread engagement had also been identified as a Unit-3 NRC concern in inspection reports 88-08 and 88-27. The licensee's corrective actions included reemphasis in training and maintenance department readings discussing thread engagement requirements which state that at least one bolt thread should be visible (Torque Manual M-37204). The team inspectors asked if the corrective actions had addressed the extent of the thread engagement problem. While the licensee was able to produce photographs of walkdowns conducted on Units 2/3, there was no documentation available to show which systems had been examined and the basis for the choice of systems. Further, there was no evidence that this condition was explored at Unit-1 via a similar walkdown.

The licensee failed to assure that conditions adverse to quality (deficient thread engagement) were promptly identified and corrected, as evidenced by repeated NRC findings and lack of documentation of the extent of the licensee investigations. (Violation 206/89-16-04)

v. Corrective Actions Not Coordinated For Emergency Lighting

Corrective actions for delays in repair of emergency lighting resulted in a temporary change (TCN) to procedure SO123-O-21, which specified that emergency lighting units be classified priority 3, with a 28 day equipment out of service limitation. This change appeared appeared to have been incompletely coordinated within the licensee organization, since it was inconsistent with a draft proposed amendment to the units-2/3 Technical Specifications. Specification No. 3.7.12.a. of the amendment indicated that if a lighting unit cannot be made operable within 7 days, then provisions will be made for alternate lighting (flashlights or portable lanterns). This item is unresolved pending submittal and approval of the proposed Technical Specification and review of implementing procedures. (Unresolved Item 361/362/89-16-05).

vi. Incomplete and Flawed Analysis of LPSI Pump Seal Leakage

The licensee technical evaluation appeared incomplete and flawed, relative to a reported event involving an unexpected amount of leakage from a LPSI pump seal.

On June 29, 1989, while performing IST of LPSI pump 3P-015, a seal leak of 1400 cc/m was measured during pump operation; no leakage was observed while the pump was idle. The Units-2/3 UFSAR specified 500 cc/min. as a realistic amount of leakage that would occur from an ESF system pump seal under a "gross seal failure." This event was reviewed by the team during the inspection between July 10 through 21, 1989; the licensee submitted Unit-3 LER 89-008 on August 1, 1989, detailing the SCE investigation and evaluation of the event.

The licensee's preliminary evaluation, presented in the LER and in verbal discussions with the inspection team, appeared incomplete and inadequate. Most notable was the fact that as late as August 2, 1989, the licensee had considered the consequences of a leak from the LPSI pump seal without addressing the generic implications of the event, i.e. the CSS pumps have identical seals and would normally operate during the recirculation phase of a LOCA. This was brought to the licensee's attention during a telephone conference with the Region V staff on August 2, 1989, and is expected to be addressed in a supplemental LER. The licensee concluded that there were no safety consequences of the unexpected leakage rate: the LPSI pump seal had been damaged by an oil spill during pump maintenance, just prior to the post-maintenance testing (IST) to affirm the pump operability, and the leak had thus only existed while the pump was out of service; also, if a LOCA had occurred while the pump was operable, there would have been no realistic potential for exceeding dose criteria and limits of 10 CFR 50 (Appendix A) or 10 CFR 100 since:

(1) the control room (CR) emergency air purification system (for which the FSAR does not take credit) would be operated to reduce the exposures of CR personnel.

(2) the pump is not normally operated during the recirculation phase of an accident, and

(3) the dose consequences from use of LPSI pumps for long term cooling (shutdown cooling) for small break LOCA scenarios would be far less severe (than consequences evaluated in the UFSAR).

The second licensee assertion (LPSI pump seals would be unlikely to see highly contaminated coolant while operating) appeared to be accurate, but incomplete. Emergency procedure EOI S023-12-9 directs that the LPSI pumps be used to provide recirculation from the containment sump during a LOCA when the HPSI and Containment Spray pumps are not available (not normally expected due to Technical Specification operability requirements); i.e. Attachment 6, "RCS Inventory Control Recovery - Priority 3", IC-2, ECCS, Step 2 states in part: "ESTABLISH LPSI pump operation for Inventory Control: a. CHECK all HPSI and Containment Spray Pumps - NOT available for Inventory Control".

The third licensee assertion (use of LPSI pumps for post-LOCA shutdown cooling) appeared to be incomplete and ambiguous. The UFSAR applied a iodine partitioning factor of 0.01 to the liquid from the pump seal leakoff lines, and 0.1 to liquid leakage past the floating bushing directly to the pump room atmosphere. During a small break LOCA, where the core can be recovered after sustaining damage (such as at TMI), the LPSI pumps would see highly contaminated water as soon as the unit is put onto the shutdown cooling (SDC) mode of operation. For this situation, the UFSAR assumptions (the pump seal will see only liquid below 212°F and the 0.1 partitioning factor for iodine leakage past the floating bushing), could be nonconservative and inappropriate: SDC entry conditions, as defined in Emergency Operating Instruction SO23-12-3, "Loss of Coolant Accident", are met when the primary system pressure is less than 340 psia and temperature is less than 385°F. Under these conditions the leakage from the pump seal could flash to steam releasing any iodine directly into the pump room atmosphere. Moreover, in view of the absence of seal drain piping discussed in the UFSAR (discussed elsewhere in this report as a UFSAR Deviation), the partitioning factor of 0.01 for leakage from the gland ring leakoff also appears nonconservative and inappropriate in this situation. The relative impact of these considerations was not addressed in the LER relative to the licensee "far less severe" conclusion.

The observed 1400 cc/min. leakage from the LPSI pump seal, after an ostensibly minor oil leakage onto the seal, implies that the UFSAR postulated "gross failure leakage" rate of 500 cc/min. may have been optimistic. The 1400 cc/min. itself was composed of 300 cc/min. past the floating bushing and 1100 cc/min. through the gland ring leakoff. If the bushing itself were physically damaged, the leakage rate could be much higher than 300 cc/min. The NRC Regional staff consulted with NRR on the significance of the 500 cc/min. value for "gross seal failure leakage" specified in the UFSAR and was informed that this number was not meant to represent a catastrophic failure of the seal, but rather a normal degradation type failure that might be expected during the course of an accident; these values were not meant to be conservative assumptions but only best guess values; observation of higher leakage rates were not considered a source of significant hazard (i.e. no worse than a pipe failure, etc. already encompassed by the design basis).
This item is unresolved pending review of the licensee's supplemental LER. (Unresolved Item 361/362/89-16-06).

vii. Incomplete Analysis of Plant Protection System Loose Connector

The disposition of an NCR 3-2294 (addressing defective connecting screws of connector J513 in a protection system panel) failed to recognize all the circuits involved, and associated requirements for post-maintenance testing. It also failed to address the potential consequences all the failure

modes, in the event the connector should come loose prior to implementation of a prescribed means of temporarily securing the connector, until it could be restored to its original design configuration.

The NCR failed to identify all circuits involved, in that it identified the problem only as a failure of one step (6.28.19) of test procedure S023-II-1.1.4. This step verified the capability of Low Pressurizer Pressure Setpoint Reset pushbutton (at the Remote Shutdown Panel L-042) to set back the trip and pre-trip setpoints for Channel D. Disposition of the NCR included an interim repair of the connector that consisted of securing the two halves of the connectors with lockwire. The post maintenance testing specified in the NCR was to "Repeat step 6.28.19 of procedure S023-II-1.1.4 to assure that the connector is properly mated.". However, the NCR did not recognize that steps 6.29 and 6.30 had also failed (Low Steam Generator Pressure channels for steam generators 1 and 2, respectively), and the wiring for these channels also was routed through the connector in question; consequently, specified post maintenance testing did not include testing of these circuits to ensure their operability. (However, the NRC team ascertained that the circuits were included in the actual testing performed).

The NCR failed to address all potential failure effects, in that it concluded that the loss of the ability to remotely step down the pressurizer and steam generator setpoints cannot prevent the Plant Protection System from performing its intended safety function. Contrary to this conclusion, the configuration of the connector was such that the bulkhead end contained exposed pins connected to the energized portion of the setpoint circuit, and the mating socket had a metallic shell. Hence, if a connector came loose, any contact between the shell and exposed pins might result in circuit connections that could affect the setpoints of the associated channels or damage the circuits. The NCR analysis was weak because it did not consider such potential consequences.

Also, the NCR disposition safety evaluation was somewhat ambiguous in its purpose, e.g. confirm that a proper judgement was made in treating the system as operable prior to the implementation of interim repairs, (which were completed about one month after the connector problem was found), versus provide a justification for the acceptability of the subsequent interim repair until such time as a final disposition of the problem could be implemented. The evaluation appeared to be directed toward only the planned interim repair, in that it stated that the use of lockwire will furnish the intended function to fasten the connector halves together and thereby provide proper electrical connection (this was in response to the question of whether the probability of occurrence of an accident or malfunction of any equipment previously evaluated in the FSAR will be increased).

The safety evaluation appeared to be flawed in its conclusion of alternative actions. In response to whether the consequences of an accident previously evaluated in the FSAR will not be increased, the NCR noted that the function performed by the connector (is) resetting of the pressurizer and steam generator variable setpoints remotely, and the setpoints can be reset from the Remote Operators Module (in the control room), the Remote Shutdown Panel (on the fifty foot level of the safety building), the Evacuation Shutdown Panel (in the forty five foot penetration area), or at the Plant Protection System. The validity of such arguments appear questionable in light of comments recorded in the Generating Station Log for Unit-3 at 0954 on November 18, 1988, which indicate that the loose connector had affected some of the above locations; i.e. "Informed by I&C that Ch D PPS Lo S/G #2 Pressure Setpoint will not reset at 3L-042, Ch D PPS cabinet, or Ch D PPS ROM." This comment appears to reference the Remote Operation Module noted in the NCR, or the Remote Control Module as referred to in the test procedure. Again the log entry at 2200 hours states: "PPS D 31 day Surv. has been completed SAT by I&C under WAR #3-8805570. Pzr Press and S/G # 1&2 Press. setpoint resets at 3L-042, PPS Cabinet and ROM in the Control Room work satisfactory."

With regard the capability to reset the setpoints of the affected channels from the Evacuation Shutdown Panel, this is a capability which did not appear to be addressed by either the monthly surveillance procedures nor the Updated FSAR.

b. Inappropriate Work Priority And Timeliness

i. Equipment Control Problem Resolution

Despite historical problems of worker safety and equipment operability concerns, corrective action with respect to the equipment control process have been slow. The licensee established a "Quality Circle" evaluation of the process which concluded in September 1988. The results of the evaluation were not used. Subsequently, the task of revising equipment control procedures has been the responsibility of one individual. However, at the time of the inspection the procedures had still not been revised, even though continued examples of inadequate equipment control have been identified by plant operations, maintenance, and QA.

ii. Emergency Lighting System Deficiencies

Corrective actions appeared to be unduly delayed for identified deficiencies in the 8-hour battery powered emergency lighting system.

Periodic surveillance tests had identified numerous deficiencies in the 8-hour battery pack emergency lighting units relied upon to achieve safe shutdown. Prior to the NRC team inspection, a significant number of corrective maintenance orders were outstanding (e.g. a 3/28/89 Unit-1 deficiency tag No. EL-L2-33-7-R was associated with a burnt out lamp in lighting unit 2XC3LBE07, inoperable for approximately 90 days; the unit provided emergency illumination at the Essential Plant Parameters Monitoring Panel. Also, a July 18, 1988 NCR S01-P-6631 described that 30 percent of the Unit-1 control room ceiling 8-hour emergency lights were failed; corrective maintenance work order Nos. 88082976000 and 8809005000 were still outstanding.).

In response to the inspectors' concerns, the licensee expedited corrective action, and provided a computer listing to show that outstanding maintenance work orders had been reduced from approximately 60 at the beginning of the inspection to approximately 13, for all three units.

The licensee indicated that the cause of the delay in completing the maintenance work orders was attributed to the lack of procedural guidance associated with prioritizing emergency lighting system repairs.

Prioritization of corrective maintenance for lighting system deficiencies had apparently been inconsistent. Based upon Equipment Status Control procedure S0123-0-21 and staff interviews, prior to July 12, 1989 there was a general understanding among the staff that the emergency lighting system corrective maintenance program should be a priority 3; however, this was not specifically stated in procedures nor elsewhere, and currently did not appear to be fully implemented. Of the 13 remaining outstanding emergency lighting system maintenance work orders (on the computer listing provided near the end of the team inspection), only one was classified as a priority 3, with a 28 day equipment "out-of-service" limit. The remaining 12 maintenance work orders were classified as priority 4 and 5, with no equipment "out-of-service" limitation.

In response to this concern, the licensee initiated procedure S0123-0-21 Temporary Change Notice (TCN) to specify that all emergency lighting deficiencies should be priority 3, and held meetings with responsible staff members to explain the need for consistent classification of deficiencies in this area.

c. <u>NCR Dispositions Incorrect or Insufficient For Implementation</u>

i. Disposition of the SIT Isolation Valves Problem

The disposition of NCRs related to the SIT isolation valve maintenance (NCRs 3-2384, 3-2387, 3-2394) did not provide adequate detail to allow for appropriate repairs to be

performed. Since neither the referenced procedure nor the NCR provided adequate instruction, the Cognizant Engineer provided instruction during the work.

The disposition for the NCR 3-2387 allowed for sampling of only one of the three remaining Unit-3 SIT valves, in the event the anticipated defect were found in the first valve. There was no evidence of an investigation to determine how many installed valves were of the same type or received in the same shipment and an appropriate statistical sample selected. Had the second valve been found satisfactory, the NCR could have been closed out without further investigation.

d. Lack of Aggressive Quality Assurance Oversight

i. Deficiency Trending

As described above, although trending was performed, apparent problems were not adequately addressed as issues.

ii. Oversight of Deficiency Identification Programs

Although the QA organization was found to be involved in the NCR program, there appeared to be no evidence that the QA organization was involved in independent review of the Division Investigation Report (DIR) process. The DIRs are reviews of programmatic deficiencies within a division. Individual divisions were completely responsible for review and disposition of the DIR program. Lessons learned from the DIR investigations have not been easily shared with other organizations.

iii. QA Resolution of Audit Findings

Although QA inspectors found MO inadequacies during an audit of SIT isolation valve maintenance, follow-up was limited to discussions with an individual planner (QAMR-060-89).

Problem Review Report (PRR) SO-070-89 described maintenance order deficiencies such as "lack of sufficient details in work plan" and "work plan does not specify or reference procedure(s) to be used." Resolution was limited to making the PRR required maintenance reading.

Problem Review Report (PRR) SO-215-88 dated 7/25/1988, regarding apparent cause identification for NCRs identified findings similar to those of the NRC Team. As corrective action, it had been proposed that the NCR form be revised to include more cause categories; this was not completed.

5. FSAR DISCREPANCIES

a. Appendix R Changes, e.g. Lockout Of ECCS Actuation

Unit-2/3 plant emergency procedures do not provide for reset of the pressurizer low pressure trip setpoint from the remote shutdown panel, as implied by the UFSAR. This matter appears to warrant clarification in the UFSAR.

The Units-2/3 PPS includes provisions to reduce the setpoint for the Low Pressurizer Pressure and Low Steam Generator Pressure channels such that the protective actions of these channels may be maintained when the pressure in these systems is reduced during a plant shutdown. The UFSAR describes the capability for effecting changes to the setpoints, from the remote shutdown panel, as a integral part of the features provided to effect a plant shutdown remote from the control room.

During the inspection, the licensee noted that a change in operating philosophy resulted from the resolution of concerns related to the requirements of 10 CFR 50 Appendix R. As a consequence, the capability to control the setpoints, from the remote shutdown panel, was no longer considered an essential function for maintaining these systems in an operable state during a shutdown remote from the control room, as well as to prevent an unwanted ECCS actuation during a plant shutdown remote from the control room (that would occur if the pressures in these systems were reduced without reducing the system setpoints).

b. Unit-3 LPSI Pump Seal Drain Piping Not Installed

UFSAR Chapter 15.6, "Decrease in Reactor Coolant Inventory" paragraph 15.6.3.3.5, "Radiological Consequences", reads in part: "...Leakage from the HPSI, LPSI, and CSS pump seal leakoff connections upstream of the pump throttle bushings is piped to the associated ESF pump room floor drain and is subsequently directed to the ESF building sump...."

Contrary to the configuration described in the UFSAR, Unit-3 LPSI pumps 3P-015 and 3P-016 were not equipped with piped leakoff lines and the leakage drained directly to the floor under the pump. The Cognizant System Engineer stated that the pumps had not, to the best of his recollection, been equipped with piped leakoff lines for the three years he had been assigned responsibility for the system. The inspector noted that the Unit-2 LPSI pumps did have the noted leakoff lines. Discharge of seal leakage to the floor increases the radiological consequences of operation of the LPSI pumps following a LOCA. This appears to be an FSAR Deviation. (Deviation 362/89-16-07)

c. Incorrect LPSI Pump Seal Leakage Data (Other ECCS)

ECCS pump seal leakage rate, upon gross failure of the seals, appears to be greater than the value stated in the UFSAR.

A 500 cc/min. leakage value, of UFSAR Section 15.6, appears to have been a nominal value for degraded leakage, reported by the vendor as having been confirmed by testing. As a consequence of oil intrusion on the elastomer seals, leakage rate actually experienced was 1400 cc/min. This appears indicative of a higher leakage rate than originally defined by the seal vendor (recognizing that catastrophic failure of the pump seals would result in much higher leakage rates). Following licensee further evaluation of this item, an FSAR change may be warranted to readdress the consequences of such failures. (See item 4.a.vi of this APPENDIX A)

d. Unit-1 Apparent Inadequate Illumination Levels

At four of five locations inspected, illumination levels did not meet the criteria described in the December 1988 Updated Final Safety Analysis Report (UFSAR) section 9.5.3.1.

At the inspectors' request, the licensee simulated a loss of all AC power at five locations in unit-1, where Appendix R Emergency lighting is provided in support of operator actions to support safe shutdown in the event of fire or in the event of station blackout conditions. The UFSAR criteria, used by the inspectors to determine the adequacy of the illumination levels, was a minimum of 0.5 foot candles in access/egress pathways and 3 or more foot-candles locally at components. The licensee's staff recorded the illumination level readings using light meter No. S00305, which was last calibrated on January 12, 1989. The following deficient conditions were identified:

i. Unit-1 #1 Diesel Generator Room

Entrance: 0.0 foot candles.
Locally at components: 0.5 to 3.5 foot candles
Other locations within the room: 0.5 to 3.5 foot candles

ii. Unit-1 #2 Diesel Generator Room

Entrance: 0.0 foot candles.
Locally at components: 0.9 to 3.5 foot candles

Also, lamp orientation for circuit breaker manipulations were not maintained. The lamp, providing illumination for the panel where the circuit breaker manipulations would occur, was not oriented in that direction. Additional examples of improper lamp orientation were identified at the Unit-2 ADVs and Unit-1 4160 Volt switchgear.

iii. Unit-1 Dedicated Shutdown Diesel Rooms

Remote shutdown panel transfer switch: 0.1 foot candles
Other locations within the room: 0.5 to 5.0 foot candles

Also, emergency light provided for the DSD start panel was inoperable. Maintenance Work Order No. 89030257001 was issued

to replace defective batteries for this lighting unit with new batteries.

iv. Unit 1 Lower Radwaste Building

Access to charging pump room: 0.5 foot candles
Valve No. 318: 0.7 foot candles
Panel B-31 (Charging pump breaker): 0.1 to 0.3 foot candles

The measured illumination levels appear to be a Deviation from UFSAR commitments. (Deviation 206/89-16-08).

6. PROCUREMENT PROGRAM DISCREPANCIES

a. Receiving Inspection Weakness For Emergency Lighting Batteries

A licensee analysis concluded that performance defects in lighting unit batteries could have been discovered through licensee receipt inspection of incoming batteries.

The June 30, 1989 Electrodex Laboratories Failure Analysis of Lightalarm Battery, Model No. CEI-5AG (associated with the Unit-1 control room emergency lighting system failures) determined that the batteries used were incapable of delivering useful capacity at rated voltage as received, and could not be restored to useable condition by charging. The analysis further concluded that the cause of the battery failures was massive shorting defects that were present during the formation state of manufacture, and it recommended that receiving inspection procedures be revised to screen out defective batteries.

The licensee's receiving inspection program will be reviewed for adequacy in this regard during a subsequent NRC inspection. (Open Item 206/89-16-09)

7. FINDINGS WHICH ARE NOT RELATED TO MAINTENANCE

a. Unavailability of Procedures at Designated Locations

Emergency operating procedures were not maintained in the locker specific identified in Dedicated Shutdown (DSD) procedure.

There were four Dedicated Shutdown (DSD) lockers at Unit-1; (the required contents of three lockers were satisfactorily maintained).

(1) Number 2 Diesel Generator Room;
(2) DSD Switchgear room;
(3) Radwaste area; and
(4) Charging Pump room.

SONGS Procedure SO1-12.3-46 (DSD Operability Test), Revision 0, paragraph 2.3.2, required that the DSD Switchgear room locker contain certain procedures, namely: one copy each of SO1-2.7-1, SO1-10-7, SO1VIII-1, SO1-7-3; and 5 copies of SO2.7-2. Contrary to

this requirement, as of July 20, 1989, the procedures identified above were not contained in the DSD Switchgear room locker. A sticker-tab handwritten note was affixed to the inside of the locker door stating that "Procedures are in the locked drawer of the desk" adjacent to the locker.

Keys to the desk were on a Control Room Operator's key ring, but were not on the Control Room Supervisor's key ring. During implementation of the Dedicated Shutdown methodology (in the event of fire or station blackout), the Control Room Operator and Control Room Supervisor are dispatched to the DSD switchgear room, and are required to implement the above noted procedures.

In response to this inspector identified discrepancy, the licensee immediately placed the required procedures in the designated locker and made plans to modify the surveillance procedure (S01-12.3-46) to provide for placing the procedures in the desk due to the limited space inside the locker.

The failure to fully implement safety related administrative procedures appears to be a violation of 10 CFR 50, Appendix B, Criterion V. This violation is not being cited because the criteria specified in Section V.A of the Enforcement policy were satisfied. (Non-Cited Violation NCV 206/89-16-10).

b. Units-2/3 Emergency Lighting For Station Blackout Conditions

Adequate emergency lighting, to cope with safe shutdown under station blackout conditions, did not appear to be provided in all areas involved in such shutdown. (See APPENDIX B)

10 CFR 50.63 requires the licensee to submit a final schedule for implementing modifications to comply with the regulation. The regulation states in part, "the modifications necessary to achieve compliance with the regulation will be established by the NRC staff in consultation with the affected licensee." The regulation does not make specific reference to emergency lighting that must be provided in support of implementing of procedures necessary to meet the requirements of the regulation. According to the regulation, after a regulatory assessment of the licensee's final analysis and schedule for implementing modifications, NRR will notify the licensee of the NRC conclusions regarding the adequacy of the proposed station blackout duration, the proposed equipment modifications and procedures, and the proposed schedule for implementing the procedures and modifications. This item is unresolved pending completion of the licensee's final analysis for compliance with 10 CFR 50.63, and related NRR review. (Unresolved Item 361/362/89-16-11).

APPENDIX B

SPECIAL INSPECTION OF EMERGENCY LIGHTING

A special inspection was conducted, in conjunction with the maintenance team inspection, to assess the licensee's state of compliance with the emergency lighting provisions of 10 CFR 50.63. With regard to preventive and corrective maintenance of lighting systems, the results of the special inspection were considered with respect to the maintenance team assessment of the maintenance program.

10 CFR 50.63 required the licensee to submit to the NRC a proposed station blackout duration to be used in determining compliance with the regulation, a description of procedures that will be implemented for station blackouts, and a list of modifications to equipment and associated procedures to meet the requirements of the regulations by April 17, 1989. The SCE April 17, 1989 submittal to the NRC contained the licensee initial station blackout coping analysis. The regulation requires final implementation of procedures and modifications within two years after notification by the NRC staff of NRC conclusions regarding the adequacy of the licensee's coping analysis, station blackout duration, plant modifications and safe shutdown implementing procedures. According to the licensee, the schedule requirements of 10 CFR 50.63 will be met.

1. FSAR/FHA Commitments

Unit 1

The lighting system in Unit-1 consists of normal, emergency and 8-hour battery pack lighting systems.

The normal lighting system receives power from the 4160V switchgear through the normal station electrical distribution system. The normal lighting system provides the visual illumination required for efficient worker performance under normal conditions.

The emergency lighting system receives power from the 120VAC or 125VDC distribution systems. The emergency lighting system is non-safety related and provides visual illumination for personnel egress under emergency conditions. The normal and emergency lighting systems are normally energized and are not tested periodically.

The self-contained 8-hour emergency lighting system consists of battery pack lighting units. These lights are not normally energized; they are connected to the 120VAC distribution system to maintain the batteries fully charged at all times. Upon a loss of 120 VAC power, these lights will activate to illuminate areas required for safe shutdown. The lights are tested quarterly and annually to ensure their operability in accordance with manufacturer's recommendations.

A May 15, 1986 NRC Supplemental SER, and Section 4.34 of the Integrated Plant Safety Assessment (NUREG 0829, December, 1986) documented the NRC staff position that 8-hour self-contained emergency lighting, satisfies requirements of section III.J of Appendix R to 10 CFR 50.

Unit 2/3

The Unit-2/3 lighting system consists of normal, emergency, essential, and self-contained 8-hour emergency lighting systems. Sections 9.5.1. and 9.5.3 of the Unit-2/3 FSAR describes the Unit-2/3 lighting systems, including the use of hand held lights.

The normal lighting system is identical to the Unit-1 normal lighting system.

The emergency lighting system is installed in all critical areas that are occupied by operations personnel, except where essential lighting is provided. This system consists of self-contained battery power pack units and light fixtures powered from either central battery pack units or non-Class station batteries. These units are automatically energized upon a loss of normal AC power and are designed to provide DC powered lighting for 90 minutes.

The essential lighting system provides lighting in the areas used during reactor shutdown under normal and accident conditions when AC or DC power is available. These areas include the main control room, auxiliary control stations, the ESF switchgear rooms, and their associated access corridors. This system consists of self-contained battery packs and light fixtures energized from class 1E AC buses during normal operation. The system batteries, battery chargers, and inverter ballast combination are designed to provide illumination for 90 minutes. The system is automatically energized in the event of loss of Class 1E AC power or disconnection of Class 1E AC power by a safety injection signal. The normal and essential lighting circuits are normally energized and are not tested periodically.

The self-contained 8-hour emergency lighting system satisfies the requirements of section 9.5.1.7 of the original SER (NUREG 0712), which required that 8-hour battery powered lighting be installed in areas of the plant necessary for safe shutdown in the event of fire (areas that must be manned to bring the plant to a safe cold shutdown, and in access and egress routes to and from all fire areas). The SER specified that the lighting design meet the requirements of Appendix A to Branch Technical Position 9.5.1, criterion III of Appendix A to 10 CFR 50, and Section III.J. of Appendix R to 10 CFR 50. The self-contained 8-hour emergency lights are tested quarterly and annually to ensure their operability in accordance with manufacturer's recommendations.

Unit-2/3 SER supplement No. 5 discusses the NRC denial of licensee's request to use portable hand held lights in lieu of fixed seal beamed 8-hour emergency lights for 10 CFR 50, Appendix R compliance. Also, by letter dated June 29, 1988, the NRC granted a Unit-2/3 deviation for the use of power supplied to the fluorescent lighting inside the control room from the emergency diesel generators, in lieu of 8 hour battery pack powered emergency lighting units. (See ISSUES)

Based on units 1, 2 and 3 single line electrical diagrams that were reviewed to verify the availability of emergency lighting under station blackout conditions, other than units 2/3 control room essential

lighting, only the Appendix R self-contained 8-hour battery pack emergency lighting can be relied upon to recover from a station blackout condition in any unit. The licensee evaluation for 10 CFR 50.63 compliance appeared to be ongoing. For the interim, the licensee intends to use hand held lights to accomplish local operator actions to achieve hot and cold shutdown in all three units in the event of a station blackout conditions. (See ISSUES)

Based on the observed status of hand-held portable lighting, this interim measure appeared to be satisfactory. The licensee maintained a locked safe shutdown locker adjacent to the unit 2/3 remote shutdown panel room. The locker contained eleven nylon satchels, a supply of twelve spare hand-held lighting batteries, in addition to other equipment needed by operators in the event that shutdown from outside the control room must be initiated.

Each satchel (bag) was assigned to a particular watch function and contained the equipment needed by the designated operator, plus one hand-held battery powered lantern. The inspectors verified that the lanterns were operable in six of the eleven satchels. The licensee practices provide for ordering spare batteries when the batteries in the lockers were 9 months old, and replacement of all batteries when they are one year old. The contents of each locker and the contents of each satchel were verified monthly by surveillance procedure No. S0123-0-6 during May and June 1989; no unresolved discrepancies were identified.

Although the licensee's interim use of hand-held lights appeared to be satisfactory, the licensee acknowledged that their request to use hand-held lights in lieu of fixed 8-hour battery powered emergency lighting for Appendix R compliance was denied by the NRC in Unit-2/3 SER supplement No. 5. The licensee stated that the ongoing station blackout study would incorporate a policy of installing fixed emergency lighting for station blackout conditions, commensurate with the lighting installed for Appendix R compliance.

Selected area plant walkdowns were performed to verify the adequacy of emergency lighting that is relied upon to achieve safe shutdown under station blackout conditions. The walkdown included access and egress routes from the units 1 and 2/3 control rooms to the steam generator atmospheric dump valve (2HV-8419 and 2HV-8421) rooms, the auxiliary feedwater pump rooms and to ten other areas where components essential to safe shutdown are located.

The emergency lighting provided to illuminate components requiring local operations to attain shutdown conditions during a station blackout may be deficient in some areas in all three units, in that fixed emergency lighting is not provided locally at components and/or in access/egress pathways. The inspectors verified that the following Unit-2/3 areas were not provided with fixed emergency lighting to support safe shutdown under station blackout conditions:

a. Unit 2/3 Containment Building

According to electrical drawings reviewed and acknowledgements by the licensee, no emergency lighting is provided inside containment to support operator actions to enter containment and isolate reactor coolant pump seal leak off to the quench tank by closing valve No. HV-9216.

b. Unit 2/3 Safety Equipment Building

Most access pathways to this area were provided with lighting from Appendix R emergency lighting, however no local emergency lighting was provided to support operator actions to align CCW pump P-025 to train A or B. The suction, discharge, supply, mini-flow, and block valves of pump No. P-025 and shutdown train circuit breakers require local manipulation by operators in several locations to complete this alignment.

c. Unit-2/3-Room-103,-Elevation 9 feet, Control Building

No emergency lighting was provided in the access path or locally at control panel No. 2/3L-418 where operators are required to transfer security non-Class 1E 120VAC instrument and control power to the affected unit.

d. Unit-2/3-Containment-Penetration Area - Penetration No. 22

The pathway to containment penetration No. 22 is provided with Appendix R emergency lighting. However, no local lighting is provided at penetration No. 22, where operators are required to establish instrument air to containment isolation valves to ensure containment isolation.

e. Unit-2/3-C-&-D-Train-480V MCC, Auxiliary Building 50-Foot Level

The pathway lighting to this area is provided with Appendix R emergency lighting. However no local emergency lighting is provided in the MCC rooms where operators are required restore power to the Shutdown Cooling Isolation Valve Inverters and accomplish shedding of non-essential DC loads.

f. Unit-2/3-Turbine-Building - Turbine Degassing Panel

The pathway to the Turbine Degas Panel is provided with partial Appendix R 8-hour emergency lighting and partial 1.5 hour non-Class 1E DC battery powered emergency lights. However, no local emergency lighting is provided at the Turbine Degassing Panel where operators are required to degas (remove hydrogen) the turbine generator.

g. Units 2/3 Control Room

Appendix R 8-hour emergency lighting is not provided in the units 2/3 control room. The NRC granted a deviation for this condition

on June 29, 1988 on the basis that power to the control room fluorescent light fixtures would be provided by the emergency diesel generators.

During station blackout conditions, the cross-tie to one of the unaffected unit's emergency diesel generators to provide power to the Unit affected by the blackout condition will result in that diesel generator supplying power to the control room fluorescent lights of the unaffected unit. The adequacy of control room emergency lighting under this condition was not determined by the inspectors. The licensee indicated that the ongoing station blackout analysis would address this issue. (See ISSUES)

2. Station Blackout Shutdown Methodology/Procedure Review

The licensee's April 17, 1989, submittal to the NRC contained evaluation of units-1/2/3 against the requirements of 10 CFR 50.63. Unit-1 is classified as an "Alternate AC unit", relying on an Appendix R Dedicated Shutdown Diesel system power supply to be available within one hour in the event of a station blackout condition. Units-2/3 are classified as "AC Independent", relying on the capability to cross-tie an emergency diesel generator power source for the affected Unit from one of the unaffected Unit's emergency diesel generators within 4 hours in the event of a station blackout. The inspector examined the plant procedures applicable to the above operations.

Unit-1 Abnormal Instruction SO1 2.7-2 implemented the Unit-1 Appendix R dedicated safe shutdown methodology, and required a voluntary station blackout for approximately 10 to 20 minutes for purpose of shedding all AC loads from vital buses and sequencing shutdown loads onto a separate bus to be powered by the dedicated shutdown diesel system. The licensee indicated that, to the extent possible, the same methodology (using the same systems and components) will be used to recover from a unit-1 station blackout condition postulated under 10 CFR 50.63.

Where no Appendix R battery powered lightings exist, the licensee relies on operators in all three units to carry flash lights to accomplish local manual actions in areas that will be without normal, emergency and essential lighting in the event of a station blackout. Unit-1 requires that operators carry flashlights through the exercise of administrative controls in the event that any of the Appendix R required battery powered lighting units are out of service. This eventuality causes the generation of an Equipment Deficiency Mode Restraint and a Limiting Condition for Operation Action Request (LCOAR) to assure that operators carry flashlights prior to entry to into Mode 4, on mode escalation, and during other mode 1, 2, 3 or 4 situations when 8-hour battery powered emergency lighting units are in need of maintenance.

The licensee's methodology and implementing procedures were not assessed for adequacy due to the licensee's ongoing review and evaluation of compliance with the regulatory requirements of 10 CFR 50.63. Only the emergency lighting aspects of the licensee's capability to achieve safe shutdown under station blackout conditions was assessed during this review (See ISSUES).

3. Plant-Walkdown of Emergency Lighting Systems

Selected area plant walkdowns were performed by the inspectors and the licensee's staff to verify the adequacy of emergency lighting that is relied upon to achieve safe shutdown under station blackout conditions. The walkdown included access and egress routes from the units 1 and 2/3 control rooms to the steam generator atmospheric dump valve (2HV-8419 and 2HV-8421) rooms, the auxiliary feedwater pump rooms and to ten other areas where components essential to safe shutdown are located. Selected local operator actions were verified to determine the adequacy of emergency lighting illumination and the feasibility of the operator actions specified in the procedures. The emergency lighting provided for local operations (station blackout) was deficient in some areas in all three units (See ISSUES).

a. Unit-2/3-Areas-- Blackout Test Results/Feasibility Of Operator-Actions

Unit-2-- 4.1 KV Switchgear Rooms
Units-2/3---Common Remote Shutdown Panel rooms
Unit-2---Essential-Plant Parameters Monitoring Panel area
Unit-2-- Auxiliary Feedwater Pump room
Unit-2 - Diesel Generator rooms

A simulated loss of AC power in these areas was performed by the licensee during the inspection at the inspector's request. The illumination level of the 8-hour battery pack lighting units provided in these areas was found satisfactory based on the inspector observation of: (1) the level of illumination provided by the 8-hour emergency lighting to support the operator's reading of labels or indicators on the associated panels, and procedures to operate equipment, and (2) the orientation of the lighting unit lamps (i.e. ability to provide illumination without obstruction/shadow casting which would have adversely impacted operator performance).

The absence of fixed emergency lighting in seven other Unit-2/3 locations and their associated access/egress pathways was verified by the inspectors. For these locations, the license relies on hand-held lights (See ISSUES).

The inspectors questioned whether a verification and validation of the ability to perform local actions required of operators in areas not serviced by Appendix R lighting or other fixed emergency lighting. In response to this concern, during the inspection, the licensee performed an additional walkdown of every step of Unit-2/3 procedure No. S023-12-8 (Station Blackout) that is performed outside the control room (with normal lighting energized), and agreed to perform this activity with normal lighting secured to verify the adequacy of lighting levels by portable lanterns in the areas of concern. On the basis of the licensee's procedure walkdown with the normal lighting energized, the licensee was confident that no discrepancies would be found when the normal lighting is de-energized.

b. Unit-1-Areas---Blackout Test Results/Feasibility Of Operator Actions

A simulated loss of all AC power was performed by the licensee in areas that were selected by the inspectors to determine that the lighting was sufficient for operators to perform the required actions in the area or locally at components. The licensee provided light meter No. SO-0305 (calibration date 1/12/89) and a technical staff member to record light meter readings of illumination levels at each location. The following criteria were used by the inspectors: 0.5 or more foot candles in access/egress pathways, and 3 or more foot candles locally at components (as specified by the licensee in UFSAR section 9.5.3.1; and inspector judgement of operator's ability to see obstacles in access/egress pathways, read procedures/instructions to operate components in total or partial darkness due to lighting obstructions or shadow castings.

In the unit-1 #1 Battery Room, the illumination levels were measured at 4 to 20 foot candles. On this basis, there appeared to be adequate illumination. The illumination levels in four other areas were deficient. (See ISSUES)

4. Emergency Lighting Preventive/Corrective Maintenance

Quarterly and annual preventive maintenance surveillance procedures, SO1-XIII-22 and SO123-XIII-53, appeared to have been performed quarterly and/or annually as required. The procedures contained appropriate instructions for conducting functional testing of each individual lighting unit to verify continuous illumination which satisfies the stated manufacturers acceptance criteria. Records of some completed surveillance tests, and associated maintenance, disclosed deficiencies which did not appear to have been corrected in a timely manner. (See ISSUES)

5. Engineering Design Basis

Unit-1 plant layout and electrical drawings (listed in APPENDIX G of this report) indicated that only the Appendix R 8-hour battery pack emergency lighting system will be available to support safe shutdown.

In Unit-2/3, emergency diesel powered control room essential lighting (in the Unit unaffected by the loss of power) and the Appendix R 8-hour emergency lighting system will be available to support safe shutdown after one and one-half hours. Also, as indicated on drawings 30312 (sheet 1), 30150-9 and 30151-7, additional 90 minute battery powered emergency lights will be available in access/egress pathways to some components required for safe shutdown.

The normal, emergency and essential lighting systems in units 1, 2 and 3 would not be available during loss of power conditions due to the loss of all AC power and the need to conserve DC battery power supplies for essential plant process monitoring instrumentation. (See ISSUES)

The NRC denied the licensee's request to use portable hand held lights in lieu of fixed 8-hour battery powered lighting for Appendix R compliance. Therefore, the use of portable hand held lights may also not be acceptable to the NRC under station blackout conditions. The licensee indicated that based on the results of the ongoing station blackout analysis for compliance with 10 CFR 50.63, consideration will be given to installing additional fixed lighting, commensurate with Appendix R 8-hour battery pack emergency lighting for station blackout conditions. (See ISSUES)

6. Reliability---Trending of Emergency Lighting Deficiencies

The licensee was in the process of developing a Technical Specification amendment which would add item 3/4.7.11, "10 CFR 50, Appendix R Safe Shutdown Systems", and item 3/4.7.12, "Eight Hour Emergency Lighting Units"; these would provide for a seven day out-of-service limitation. To assist in implementation of the planned amendment, the licensee was also developing a trending program for emergency lighting deficiencies (Currently, emergency lighting deficiencies are not part of a trending program). The proposed trending program is expected to be implemented by late 1989, and will identify usage levels of repair parts over the past few years. This will enable plant support staff to establish proper stock levels of spare parts for prompt repairs to meet the seven day out-of-service limitation.

7. Preoperational Test Results

Design Change Package No. 3341.09, dated August 22, 1986, appeared to provide sufficient 8-hour emergency lighting to satisfy the requirements of section III.J of Appendix R to 10 CFR 50. The DCP indicated that preoperational testing was satisfactorily performed on the self-contained 8-hour emergency lighting systems for units 1/2/3. On the basis for the completed DCP, it appeared that the licensee performed appropriate preoperational testing of the 8-hour battery pack emergency lighting system prior to startup from the last refueling outage.

8. Conclusions

The inspectors found no vulnerabilities in hardware, personnel or program controls which could lead to plant transients if uncorrected.

However, the issues were identified in the following areas:

a. Apparent inadequate controls for prompt corrective action regarding emergency lighting system deficiencies

b. Apparent inadequate illumination Levels in Unit-1.

c. Unavailability of procedures at designated locations

d. Some Unit-2/3 station blackout areas were not provided with fixed emergency lighting, potentially adversely impacting operator performance.

APPENDIX C

REVIEW OF EQUIPMENT CLEARANCE ALLEGATION RV-89-A-0041

During the Maintenance Inspection Team on-site preliminary reviews and inspection preparation activities June 26 - 30, 1989, the NRC Resident Inspector was advised of an early June 1989 complaint to CAL-OSHA. The matter involved control of equipment status for maintenance and associated weakness of program controls and/or implementation. This subject was directly related to the scope and focus of the Maintenance Team Inspection, and the information in the complaint was incorporated into the work, records, and personnel interview activities of the inspection team. Characterization, assessment, and conclusions regarding items in the complaint are consolidated below, in this separate APPENDIX to the team inspection report. This data was also considered in the team findings, conclusions and ratings discussed elsewhere in this report.

The team findings included substantiation of all four elements of the complaint/allegation, concluding that the licensee staff had violated established SCE San Onofre plant administrative and work control procedures.

1. Characterization of Complaint/Allegation

   The complaint maintained that work conducted under Work Authorization Record (WAR) 2-8902448 on May 30, 1989:

   a. Violated procedure SO123-XV-10.0 "Multiple Work Items Against a Single Work Authorization", and procedure SO123-O-21 "Equipment Status Control";

   b. The procedure violation, a., above, created a worker safety hazard;

   c. The noted specific hazard, b., above, is only one example of many continuing incidents in which violations of these procedures have lead to unsafe working conditions;

   d. Procedure SO123-XV-10.0 TCN 0-1 referenced outdated procedures SO13-O-13 and SO1-14-34.

2. Implied Significant to Design, Construction or Operation

   In addition to maintaining safe working conditions, the Work Authorization procedures are one of the administrative tools which ensure proper control over nuclear plant systems maintenance, including the continued integrity of contaminated system boundaries and operability status during maintenance activities.

3. Assessment of Safety Significance

   The inspectors reviewed the circumstances of work conducted under Work Authorization Record (WAR) 2-8902448 and, in a larger context, the adequacy of the licensee's procedures to control work authorizations and clearances. The following facts were noted.

a. On May 17, 1989 the WAR was accepted by a Machinist Upgrade Foreman. A "Clearance" tag had been hung on Containment Spray Pump #12 in Unit-2, for replacing pump casing and suction flange gaskets. This work would involve all four craft disciplines (designated on the WAR as: EL, MA, BC, IC). The WAR specified four Maintenance Orders (MOs), one assigned to each craft, that were authorized to be worked under this authorization.

When the upgrade machinist foreman signed to accept the WAR, per SO123-O-21/6.18.3, he became responsible for the safety of the people working under his supervision and must inform them of work limitations, hazards, and any changes in equipment status. The persons for which he is responsible are listed on Form SO(123)-1356 and in this case could be any craft with an MO listed on the WAR or any other person who opens additional MOs on Form SO(123)-1356. Formal transfer of this responsibility, in writing, on the WAR per SO123-O-21/6.19, is normally not done if the WAR holder (Machinist Foreman) leaves the site but remains reachable, i.e. by telephone at home. Thus, the defacto on-site responsibility for safety and equipment status control is transferred informally from shift-to-shift among craft foremen.

b. Between May 17, 1989 and May 31, 1989, three of the four crafts (MA, BC, EL) worked their authorized MOs via signing on/off a separate form, SO(123)-1356, Attachment 1 to procedure SO123-XV-10.0 "Multiple Work Items Against a Single Work Authorization". The fourth craft (IC) signed onto the WAR document itself, between May 21, 1989 and May 30, 1989.

Three different crafts signed onto the WAR via Form SO(123)-1356, which placed them under the responsibility of the WAR holder (Machinist Foreman),or an unspecified on-shift foreman, if the WAR holder was off-site. However, procedures allowed the fourth craft (IC) to sign directly onto the WAR itself, instead of Form SO(123)-1356, creating an inconsistency in the way WAR holder responsibility is specified, i.e. when do individual crafts sign on the WAR itself (in the control room) or on Form SO(123)-1356 (in the General Foreman's office).

c. Between May 24, 1989 and May 26, 1989, two more MOs (Welder, MA) were active under Form SO(123)-1356. These MOs were not listed on the WAR itself.

When additional MOs and other crafts (i.e. welders) sign onto Form SO(123)-1356 under the WAR holder, a foreman must also sign the form for each new MO. Although the intent of SO123-XV-10.1/6.2.1 appears to be that this foreman be the same as the WAR holder, and that he accepts responsibility for the safety of the persons opening the new MOs, in practice it can be any foreman. Thus, the WAR holder may not be advised of the added work.

d. On May 30, 1989 graveyard shift there were three active MOs (MA, EL, Welder) listed on Form SO(123)-1356 and one active MO (IC) listed on the WAR itself. The electricians had just completed electrical reconnection of the motor on the swing shift; the machinists were actively working the gasket replacement; the welder was not actively working. During turnover, the graveyard shift General Foreman was under the impression that the pump was ready for a rotation check. He assigned an electrical foreman to release the "Clearance" and "bump" the pump. A modification to the WAR was prepared (WAM) to temporarily remove "Clearance" tags on the pump breaker and controls. The IC "Clearance" holder signed the WAM to acknowledge the change; the electrical foreman signed the WAM to release the WAR which had been originally accepted on May 17, 1989 by the Upgrade Machinist Foreman. This action effectively removed the "Clearance" for the 3 MOs active on Form SO(123)-1356, (MA, EL, Welder). However, the electrical foreman failed to notify either the machinists or the welders that a change to the "Clearance" status was going to occur; the machinists discovered this intent just as a control room operator was preparing to bump the pump. Subsequently, the pump was not bumped and the "Clearance" was restored so that machinist work could continue.

A modification to the WAR was not necessary, since the pump rotation check could have easily waited until all work was complete and the WAR was released. However, both general foremen conducting shift turnover, neither of whom were signed on the WAR in question, concluded that the pump needed to be bumped on the next shift, as soon as possible. The electrical foreman, who was told to release the WAR, was not the WAR holder (the Upgrade Machinist Foreman). Since the WAR holder was unavailable, SO123-O-21/6.21.2 allowed "a cognizant supervisor" to release instead, provided: he inspects the equipment to ensure the release will not constitute a personnel hazard, and the control room SRO investigates the situation fully. This was not done; furthermore, it is questionable that the electrical foreman qualifies as a "cognizant supervisor" over the machinist foreman's authorized work. It was also a requirement of SO123-O-21/6.18.6/6/20.2 that all persons working under an authorized WAR be notified of any release of the WAR or any tagging status changes, so as to prevent their injury or damage to equipment. Also, SO123-XV-10.0/6.2.3.1 required the releasing foreman to review Form SO(123)-1356 to ensure all entires are complete and the job is complete, which was not done.

e. The WAR 2-8902448 did not meet the following administrative requirements of procedure SO123-O-21, Attachment 2:

i. Keypoint 34 required a tailboard meeting if "equipment important to safety is removed from service." This condition applied and, in addition, the work involved multiple crafts; however, no tailboard was required by the WAR.

ii. Keypoint 37 required "When and Why" comments if the WAR is released and more work was required. The "When" comment was not made.

iii. Keypoint 47 required the date/time that the tagging is completed be indicated. This was not done.

iv. Keypoint 48 allowed work boundary components to not have their position verified, where determined "Not-Important-To-Safety". The control room handswitch, which controlled activation of the pump motor, was inappropriately not verified.

v. Keypoint 48 required unused spaces on the "Clearance" item list to be crossed through with "diagonal lines...to prevent unauthorized add-ons". This was not done; also, a handwritten add-on was made.

vi. Keypoint 36 required the "releasors" of a WAR to record the date of release. One of four "releases" did not record the date.

vii. Although not required by a keypoint, a provision on the WAR exists for each holder of the WAR to indicate the specific work documents he is accepting. Two-out-of-four holders did not use this provision, including the holder with multiple MOs. WARs used by Unit-2/3 personnel routinely did not use this provision; however, Unit-1 personnel did routinely use the provision.

As indicated above, the procedural administrative provisions were not met. Review of other active and closed WARs revealed many similar discrepancies.

f. The history of Work Authorization problems at SONGS included the following incidents, which appear to be only a partial listing of the complete history:

i. On December 23, 1987 the east fire pump was cleared for mechanical work (WAR 1-8702714). While work was subsequently in progress, a test technician "buddied" onto the WAR via Form SO(123)-1356 and began work on the annunciator; the annunciator circuit was unexpectedly found to be energized. Investigation showed that the control room "Clearance" was given only for mechanical work, and the mechanical "Clearance" holder was not qualified to determine the adequacy of the "Clearance" to approve electrical maintenance. NRC review of this matter was documented in Inspection Report 50-206/87-29.

ii. On or about February 16, 1988 an IC technician was holding an "Approval" (WAR 2-8800624) to perform work on a level instrument of the charging pump seal-water tank. The tank needed to be drained to perform the work. However, an "Approval" did not guarantee that the equipment will not be operated; therefore, a condition was created in which there was a hazard to both equipment and personnel if the pump had been operated. A "Clearance" would have required a tagout, whereas an "Approval" did not.

iii. In approximately April of 1988, the Maintenance Manager commissioned a Maintenance Safety Quality circle to "investigate alleged problems with the SONGS Work Authorization Process."

iv. On February 18, 1988 QA Surveillance Report SOS-064-88 reported that "In response to a Nuclear Safety Concern, the Quality Assurance Organization (QAO) performed an assessment of the Work Authorization Record (WAR) Program. The nature of the Nuclear Safety concern led to an in-depth evaluation of the WAR Program. The main objective of the assessment was to ascertain whether or not the WAR Program establishes worker safety. Subsequent to the review of the WAR program, it cannot be stated categorically that the WAR program establishes worker safety."

v. On July 11, 1988 Operations issued WAR 3-8801538 for electrical work; however, no "Clearance" tag was hung on the appropriate electrical breaker.

vi. On July 18, 1988 an "Approval" (WAR 3-8801499) was released without notification of the "Approval" holder.

vii. On August 12, 1988 a "Clearance" (MO 88071167) was released on an electrical system while work was still being conducted.

viii. On February 11, 1989 a technician installing a new coil on a solenoid value discovered energized field leads due to an incorrect "Clearance" associated with MO 89021033.

ix. On April 27, 1989 a "Clearance" on electrical heat tracing was released while lagging work over the tracing was still in progress under MO 88091366. This was documented on a licensee Maintenance Professionalism audit.

x. On May 7, 1989 an inappropriate work authorization "Approval" was issued for work under MO 89050398. The "Approval" did not isolate equipment, however, the job called for equipment removal from a system . This was documented on a licensee Maintenance Professionalism audit.

xi. On May 30, 1989 a "Clearance" (WAR 2-8902448) was released to energize a component on which other "Clearance" holders were still working. Maintenance Incident Investigation Report 89-020 established the cause of this incident to be procedural violation.

xii. On July 10, 1989 a Radwaste Tank collapsed while being drained. This occurred following inspection of the tank vent path and placement of a Foreign Material Exclusion (FME) cover over the vent hole, as authorized by an "Approval" WAR (this is <u>not</u> a "Clearance" and thus allowed the tank to remain operable). The licensee's investigation (ODIR 2-89-11)

concluded that the root cause was inappropriate installation of FME. (However, had a "Clearance" been issued on the WAR, the tank would have been isolated during this work and the tank level could not have been changed. The choice of an "Approval" vice a "Clearance" appears to be an important contributor to this event; however, the licensee's investigation did not address this factor.).

Records confirmed personnel interviews describing clear and convincing evidence that hazards to personnel and equipment have continued to occur and that licensee management initiated remedies have been ineffective to date. At the time of this inspection the licensee was preparing to issue new revisions to procedures S0123-0-21 and S0123-XV-10.0, but the development of these revisions had been assigned to one person since September 1988 and the extended time to complete this task was related to the priority given it by management. It was also clear that these procedures were being violated due to inattention and lack of commitment on the part of maintenance and operations personnel.

g. As of July 20, 1989, procedure S0123-XV-10.0 "Multiple Work Items Against a Single Work Authorization", Revision 0 (Temporary Change Notice dated August 28, 1987) still had references to procedures S023-0-13 and S01-14-34, which had been superseded July 12, 1988.

The above is indicative of a lack of use or review of procedure S0123-XV-10.0, since one year had elapsed with no request being made to update the reference procedures.

4. Conclusions

The SCE Accident Prevention Manual (APM) appeared to rely heavily on the personal responsibility assumed by supervisors and operators in ensuring that the extent of work required is understood by all parties, equipment is properly and safely cleared, and that once work is fully complete and all workers are clear, clearances can be released and equipment restored to service. San Onofre implementing procedures for the APM are consistent with this reliance on personal responsibility of an equipment clearance holder. However, because of the nature of long duration, multi-craft jobs, provisions were made to accommodate the many occasions when the clearance holder is not available. This created a conflict wherein the basic principle used to ensure safety is routinely bypassed, thus opening the door to inattentiveness and sloppiness.

Based on the analysis of facts, the inspectors concluded that:

a. On May 30, 1989, under WAR 2-8902448, procedure S0123-0-21 was violated (sections 6.5.1, 6.20.2, 6.18.6) and procedure S0123-XV-10.0 was also violated (section 6.2.3.1);

b. This occurrence, a., created a worker safety hazard and an equipment damage potential;

c. This occurrence, a., is only one of many that have been identified by management sponsored programs for well over one year without effective resolution;

d. Persons responsible for carrying out the provisions of SO123-O-21 and SO123-XV-10.0 were routinely not referring to the procedure as evidenced by the many administrative deficiencies, failure to adhere to requirement and provisions, and failure to update procedures when necessary;

e. The procedures allow excessive interpretation, causing inconsistencies which may lead to misunderstandings and a consequent breakdown in the equipment control process.

f. The impact of the discrepancies experienced appeared to be predominantly related to increased risk to worker industrial safety. This matter was addressed by the licensee with the appropriate jurisdiction (CAL-OSHA) as a result of a worker complaint.

g. No risk to nuclear safety was identified, associated with the identified discrepancies in the handling of equipment clearances (Work Authorization Record process). However, ineffective handling of equipment clearances has the potential to inadvertently activate equipment in such a manner as to impact operable/operating safety related equipment in an unacceptable manner.

5. Conclusions with respect to the allegations

All four allegations, as specified in paragraph 1., were substantiated.

6. Action Required

The licensee should expedite resolution of the weaknesses in the equipment clearance control process. Effectiveness of licensee actions will be reviewed during future NRC inspections and event evaluations.

A Notice of Violation will be issued with this inspection report, relative to failure to implement the approved work authorization procedures, as relating to potential damage to safety related equipment. The allegations, as a separate matter, are considered closed.

APPENDIX D

PERSONS CONTACTED DURING THE INSPECTION

1. Southern California Edison Company

J. Anderson, Project Coordinator, SISS
M. Anderson, System Cognizant Engineer
J. Anderson, Manager, Engineering and Service Maintenance
A. Arganda, Foreman, B&C
J. Armas, Cognizant Engineer
* R. Baker, Onsite Nuclear Licensing
* C. Balog, Nuclear Engineering Safety and Licensing
D. Barrers, Emergency Preparedness
J. Baumeister, Supervisor, Machine Shop
J. Beeks, Reliability Engineer
N. Bloom, Contract Management
R. Bockhorst, Performance Monitoring
D. Bouch, Machinist MA23
M. Breitner, Lead Inspector, Quality Control
D. Brevig, Supervisor, Onsite Nuclear Licensing
D. Brown, Supervisor, Planning/Machinists
W. Brush, Station Technical Division (NSSS)
J. Butcher, Supervisor, Production
G. Buxton, STA Cognizant Engineer
* B. Carlisle, Supervisor, Site Nuclear Engineering
* L. Cash, Manager, Site Maintenance
C. Chui, Assistant Manager, Station Technical
T. Clepper, Toolroom Foreman
M. Colonnese, Instructor, Maintenance Training
J. Cronk, General Foreman
P. Croy, Station Technical Division, Mechanical Engineer
D. Ensminger, Emergency Preparedness
* J. Fee, Assistant Manager, Health Physics Operations
S. Foglio, Plant Technical Electrical Engineer
J. Foulk, Supervisor, Nuclear Data Engineering
D. Fowler, Foreman, B&C/Mechanics
S. Gainnell, Operations
B. Garcia, Union Business Agent (UWUA)
J. Gartland, Cognizant Engineer LPSI/HPSI
* G. Gibson, Onsite Nuclear Licensing
G. Gisi, Emergency Preparedness
D. Goodwin, Station Technical Division
E. Golden, Supervisor, Health Physics Engineering
* S. Gosselin, Supervisor, Site Nuclear Engineering
A. Grande, Nuclear Engineering Department
J. Graves, Acting Supervisor, Maintenance Training
G. Gross, Operations
D. Hadley, Supervisor, Procurement Engineering
R. Hamilton, Unit-2/3 General Foreman, Machinists/Helpers
L. Hazelton, NCR Administrator
J. Henderson, Station Technical Division, Electrical Engineer
* D. Herbst, Manager, Site Quality Assurance
V. Herrera, Station Technical Division, Electrical Engineer

M. Herschthal, Supervisor, Cognizant Engineers
R. Hobbs, Supervisor, Planning/Electrical
F. Holts, Manager, Procurement
G. Honeycutt, Maintenance Foreman
G. Johnson, Jr., System Cognizant Engineer, SIS
K. Johnson, Operations
M. Johnson, Emergency Preparedness
* B. Katz, Manager, Operations and Maintenance Support
S. Khamamkar, Station Technical
C. King, Supervisor, Planning/Mechanical
W. Kirby, ISEG Engineer
* P. Knapp, Manager, Health Physics
J. Kopfstuhl, Tool Room Foreman
J. Koran, Supervisor, Unit-1 Maintenance Planners
M. Kotur, Mechanic BC23
R. Kowal, Emergency Preparedness
* R. Krieger, Manager, Operations
J. Krohm, Training Coordinator
R. Lee, Manager, Nuclear Safety Group
T. Llorens, Licensing
J. Madsgan, Supervisor, Units-2/3 Health Physics
L. MaGee, Electrician EL23
L. Marano, Machinist MA23
N. Maringas, Supervisor, Quality Assurance Information Analysis Trending
M. Marzeh, Supervisor, Spare Parts
D. McBride, Maintenance I&C Foreman
* C. McCarthy, Vice President/Site Manager
M. McKinley, Station Technical Division
S. McMahan, Assistant Manager, Maintenance
R. McPherson, Maintenance Specialist
J. Mearns, Nuclear Engineering Department
H. Merten, Supervisor, Administration and Engineering Support
D. Mette, Manager, Operations Training
A. Molina, Cognizant Engineer, Feedwater System
G. Moore, Operations
* H. Morgan, Station Manager
* F. Nandy, Manager, Nuclear Licensing
* D. Nunn, Manager, Engineering and Construction
D. Peacor, Supervisor, Emergency Preparedness
E. Pentecost, Performance Monitoring, Electrical Engineer
J. Perry, Supervisor, Stores
K. Persly, Maintenance Procedures Writer
J. Peterson, Manager, Maintenance Engineering and Services
W. Quinn, Supervisor, Warehouse
M. Ramsey, QA Technical Services Supervisor
R. Randolph, Unit-1 Electrical General Foreman
R. Reiss, QA Surveillance Supervisor
H. Revie, QA Engineer
L. Rice, Supervisor, Warehouse Operators
H. Richmond, Procedure/Training Coordinator
B. Richter, Nuclear Engineering Department
D. Ripley, General Foreman, Unit-1 Mechanical
D. Roberts, STA Cognizant Engineer
M. Rodin, Supervisor, Reliability Engineering Configuration Control

S. Rudock, Technician IC23
R. Sanders, Operations and Maintenance Support
R. Sarouhan, QA Technical Services
* R. Schumacher, Nuclear Engineering Safety and Licensing
H. Schutter, STA Cognizant Engineer
R. Shideler, Unit-2/3 Maintenance Machinist Foreman
* J. Shipwash, Supervisor, Compliance
S. Schofield, Acting Supervisor, Health Physics Engineering
J. Scott, Supervisor, Unit-1 Health Physics
J. Senies, Lead Planner, Machinists
R. Sheridon, Supervisor, Maintenance Training
R. Shiedeler, Foreman, Machinists
* M. Short, Nuclear Engineering Safety and Licensing
R. Shpall, Nuclear Engineering Department
* D. Shull, Manager, Nuclear Oversight
L. Southworth, Reliability Engineer
M. Steinkamp, Operations Shift Supervisor
S. Stempien, Daily Scheduler
D. Stonecipher, Manger, Site Quality Control
A. Talley, Health Physics General Foreman
C. Taylor, Industrial Safety Engineer-Maintenance
K. Thind, Station Technical (NSSS)
G. Tilton, Operations
J. Tipton, General Foreman, B&C/Welder/Painter
J. Travis, Supervisor, Unit-1 Maintenance
M. Trillo, Operations
K. Trind, Station Technical Division, (NSSS)
T. Vogt, Plant Superintendent
R. Waldo, Acting Station Technical Manager (through 7/10/89)
R. Waller, Shift Supervisor
P. Wattson, Compliance
K. Wells, Site Nuclear Engineering Representative
M. Whitegon, Machinist MA23
G. Wilczeh, Maintenance Supervisor I&C/Radiation Monitoring
C. Williams, Licensing
K. Wells, Site Nuclear Engineering Representative
* D. Werntz, Engineering Representative
J. Wirtz, Foreman, Unit-1 Maintenance Machinists
L. Wright, Supervisor, Reliability Engineering/Performance Monitoring
C. Zabavitel, Maintenance and Administrative Services
W. Zintl, Supervisor, Technical Training

San Diego Gas and Electric

* R. Lacy, Manager

In addition to the personnel listed above, during the course of the inspection the inspectors also contacted other licensee employees, including: operations staff, health physics and maintenance technicians, engineers, quality assurance staff, and various supervisors.

*Identifies individuals who attended the exit management meeting on July 21, 1989.

2. NRC Staff and Consultants at Exit Meeting

*	D. Kirsch,	Region V, Reactor Safety Branch Chief
*	A. Toth,	Region V Inspection Team Leader
*	A. Hon,	Resident Inspector
*	J. Burdoin,	Region V Team, Engineering Inspector
*	D. Coe,	Region V Team, Palo Verde Resident Inspector
*	T. Dunning,	NRR/Technical Specifications Branch
*	K. Johnston,	Region V Team, Diablo Canyon Resident Inspector
*	J. Russell,	Region V Team, Radiation Specialist
*	D. Schultz,	INEL/EG&G/COMEX Team Consultant

APPENDIX E

ACRONYMS USED AT SAN ONOFRE NUCLEAR GENERATING STATION (SONGS)

Organizations

HP	Health Physics
M&AS	Material and Administrative Services
NIS	Nuclear Information Services
NO	Nuclear Oversight
O&MS	Operations and Maintenance Support
ONL	Onsite Nuclear Licensing
SPG	Site Procedures Group
SSS	Site Support Services
STEC	Station Technical

GENERAL TERMS

ACA	Annunciator Compensatory Action
ACE	ASME Code Engineer
ALARA	As Low As Reasonably Achievable
AOV	Air Operated Valve
ASME	The American Society of Mechanical Engineers
AWS	Administration, Warehouse, and Shop (Building)
B/M	Bill of Material
BA	Boric Acid
BAM/BAMU	Boric Acid Makeup
BDCS	Bechtel Drawing Control Section
BFP	Boiler Feed Pump
BOP	Balance of Plant
BPC	Bechtel Power Corporation
C/R 1	Control Room 1
C/R 2	Control Room 2
C/R 3	Control Room 3
C/S	Civil - Structural
CAIS	Containment Atmosphere Isolation System
CAOMS	Continuous Axial Offset Monitoring System
CAR	Corrective Action Request
CCAS	Containment Cooling Actuation System
CCW	Component Cooling Water
CCWS	Component Cooling Water System
CDM	Corporate Documentation Management
CE	Combustion Engineering
CEA	Core Element Assembly
CEAC	Core Element Assembly Calculation
CEDA	Control Element Drive Assembly
CEDM	Control Element Drive Mechanism
CEDMCS	Control Element Drive Mechanism Control System
CFMS	Critical Function Monitoring System
CIAS	Containment Isolation Actuation Signal
CIDR	Construction Inspection Data Report
CIDREL	Construction Inspection Data Report Exception List
CIS	Containment Isolation System
CMTR	Certified Material Test Report

COLSS	Core Operating Limit Supervisory System
CPC	Core Protection Calculator
CR	Control Room
CSAS	Containment Spray Actuation System
CSIS	Containment/Sphere Isolation System
CSS	Containment Spray System
CTO	Construction Turnover
CV	Control Valve
CVCS	Chemical Volume and Control System
CWO	Construction Work Order
DCN	Design Change Notice
DCP	Design Change Package
DIT	Deficiency Identification Tag
DG	Diesel Generator
E&C	Engineering and Construction
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EDMR	Equipment Deficiency Mode Restraint
EEI	Edison Electric Institute
EFAS	Emergency Feedwater Actuation System
EFPD	Effective Full Power Days
EOF	Emergency Operating Facility
EOI	Emergency Operating Instruction
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
ESF	Engineered Safety Features
ESFAS	Engineered Safety Features Actuation System
FCN	Field Change Notice (Field change to a drawing)
FCR	Field Change Request
FHA	Fire Hazards Analysis
FHIS	Fuel Handling Isolation System
FME	Foreign Material Exclusion
FSAR	Final Safety Analysis Report
FSR	Field Surveillance Report
FWCS	Feedwater Control System
GEC	General Electric Construction
HPSI	High Pressure Safety Injection
HVAC	Heat/Ventilation Air Condition System
ICV	Isometric Change Verification
IDCN	Interim Design Change Notice
INPO	Institute of Nuclear Power Operations
IPSS	Instrumentation Power Supply System
ISEG	Independent Safety Engineering Group
ISO	Isometric Drawing
LCO	Limiting Condition for Operation
LCOAR	Limiting Condition Operation Action Required
LER	Licensee Event Report
LHR	Linear Heat Rate
LOCA	Loss of Coolant Accident
LPSI	Low Pressure Safety Injection
MC'S	Mill Certificates
MCC	Motor Control Center
MDRF	Material Deficiency Report Form
MERS	Maintenance Engineering Repair Specification

MFWP	Main Feedwater Pump
MFWT	Main Feedwater Turbine
MIDL	Master Index and Drawing List
MO	Maintenance Order
MOV	Motor Operated Valve
MRR	Material Receiving Report
MS	Main Steam
MSIS	Main Steam Isolation System
MSIV	Main Steam Isolation Valve
MSG	Maintenance Support Group
MSR	Main Secondary Reheater
MSV	Main Stop Valve
MTR	Material Test Report
MUD	Makeup Demineralizer
NCR	Nonconformance Report
NCRA	NCR Administrator
NDT	Non-destructive Test
NIS	Nuclear Instrumentation System
NSR	Non-safety Related
NSSS	Nuclear Steam Supply System (N-Triple S)
OCT	Out of Commision Tag
ODCM	Offsite Dosimetry Calculation Manual
OMS	Overpressurization Mitigating Systems
ORMS	Operational Radiation Monitoring System
OSC	Operational Support Center
OSHA	Occupational Safety and Health Administration
OSRC	Onsite Review Committee
P&ID	Piping and Instrumentation Drawing
PAMI	Post Accident Monitoring Instrumentation
PASS	Post Accident Sampling System
PCN	Procedure Change Notice
PCV	Pressure Control Valve
PFC	Proposed Facility Change
PLCEA	Part Length Control Element Assembly
PM	Preventive Maintenance
PMF	Probable Maximum Flood
PMO	Preventive Maintenance Order
PMP	Procedure Modification Permit
PMS	Plant Monitoring System
PMT	Post Maintenance Testing
PO	Purchase Order
PPS	Plant Protection System
PWR	Pressurized Water Reactor
PZR	Pressurizer
RCP	Reactor Coolant Pump
RCS	Reactivity Control System/Reactor Coolant System
REP	Radiological Exposure Permit
RHR	Residual Heat Removal
RIDR	Receiving Inspection Data Report
R-NCR	Root Cause NCR
RPCS	Reactor Power Cutback System
RPS	Reactor Protection System
RTD	Resistance Temperature Detector
RWST	Refueling Water Storage Tank

RX	Reactor
Rev.	Revision
SCE	Southern California Edison
SCN	Specification Change Notice
SDC	Shutdown Cooling
SDCS	SCE Document Configuration System
SDR	Supplemental Data Report
SI	Safeguards Information
SIAS	Safety Injection Actuation System
SIDR	Storage Inspection Data Report
SIS	Safety Injection System
SISS	San Onofre Integrated Scheduling System
SIT	Safety Injection Tank
SLSS	Safeguard Load Sequencing System
SOCR	San Onofre Commitment Register
SOER	Significant Operating Experience Report
SOMMS	San Onofre Maintenance Management System
SPEER	Spare Parts Equipment Evaluation Report
SPR	Site Problem Report
SPG	Station Procedures Group
SR	Safety Related
SRM	Source Range Monitor
SSAM	Shift Superintendent Accelerated Maintenance
SSE	Safe Shutdown Earthquake
STA	Station
STA	Shift Technical Advisor
SWCP	Salt Water Cooling Pump
TCN	Temporary Change Notice
TE	Thermal Element
TER	Test Exception Report
TFM	Temporary Facility Modification
TI	Test Instruction
TICN	Test Instruction Change Notice
TMI	Three Mile Island
TPCW	Turbine Plant Cooling Water
TS	Technical Specifications
TSO	Time Share Option
UFSAR	Updated Final Safety Analysis Report
UPS	Uninterrupted Power Supply
VCT	Volume Control Tank
VPCN	Vendor Print Change Notice
WAIS	Work Authorization Information System
WAM	Work Authorization Modification Permit
WAR	Work Authorization Request (i.e. clearance order)
WFPD	Withhold from Public Disclosure
W-NCR	Warehouse NCR

APPENDIX F

ADVANCE DATA REQUESTED BY THE TEAM

The NRC Maintenance Inspection Team Leader visited the site May 30 - 31, 1989 to arrange for site access training and facilities for the team, and specific records and indices to be available to the team during its June 26 - 30, 1989 orientation and preparation at the site. The following initial records were requested and were provided by the licensee; (additional records and procedures were also examined by the team members during the inspection):

a. Computer printout of all Maintenance Orders (MOs), sorted by system and priority, which reached Category 40 (available for work) for the period June 1, 1988 through June 20, 1989.

b. Listing of the Maintenance Backlog as of June 20, 1989, and copies of any report(s) on this subject for the period June 1, 1988 through June 20, 1989.

c. Listing of Shift Superintendent Accelerated Maintenance (SSAMs) issued for the period June 1, 1988 through June 20, 1989.

d. Listing of all Maintenance Orders (MOs) issued June 1, 1988 through June 20, 1989 which required rework.

e. Copy of the document which represents a "Maintenance Policy Guide".

f. Copies of any equipment problem reports for the period June 1, 1988 through June 20, 1989.

g. Any equipment/component performance indicator or reliability trending reports for the period June 1, 1988 through June 20, 1989.

h. Listing of all CARs and QA Audits of the Maintenance Department for the period June 1, 1987 through June 20, 1989.

i. Listing of all Maintenance-related Site Problem Reports (SPRs) for the period June 1, 1988 through June 20, 1989.

j. Current copy (as of June 26, 1989) of the SPG Procedures Index (excluding cancelled and superseded procedures).

APPENDIX G

SPECIFIC IDENTIFICATION OF DOCUMENTS REFERENCED IN THIS INSPECTION REPORT

PROCEDURES AND INSTRUCTIONS:

Procedure	Revision		Title of Document
SO123-G-1	5		Requirements for rising standards of maintenance adequacy
SO123-G-2	2		Procedure compliance and validation
SO123-G-22	5		Maintenance policy guideline titled SCE/contractor mandatory and selected training program
SO123-G-14	1		Plant material condition inspection program
SO123-G-24	3		Maintenance Professionalism program
SO123-IS-1	2		Industrial safety program
SO123-MA-1	1		Maintenance program
SO123-MS-1	1		Material support program
SO123-MT-1	1		Measuring and test equipment program
SO123-O-5	0	TCN 0-1	Plant equipment operator's responsibilities and duties
SO123-O-21	1	TCN 1-4	Equipment status control
SO123-S-6	6		Preventive maintenance program objectives and responsibilities
SO123-I-1.0	1	TCN 1-9	Maintenance documentation
SO123-I-1.3			Maintenance Documentation
SO123-I-1.7	2		Maintenance order preparation, use and scheduling
SO123-I-1.9	1	TCN 1-3	Repetitive maintenance implementation and scheduling
SO123-I-1.13	3		Cranes, rigging and lifting controls
SO123-I-1.18	2	TCN 2-5	Foreign material exclusion control during maintenance, testing and inspection activities
SO123-I-1.25	0	TCN 0-4	Maintenance verification testing
SO123-I-1.30	0	TCN 0-3	Administration of maintenance manuals
SO123-I-6.8	0	TCN 0-13	Actuators - Limitorque models SMB-0 through SMB-4, and SB-0 through SB-4
SO123-II-1.0	1		Calibration and control of measure and test equipment
SO123-II-1.1	1		Preparation and routing of the report of calibration failure
SO123-II-1.2	1		Preparation and responsibility of the M&TE traveler
SO123-II-1.5	1		Evaluation of calibrated items after M&TE failure
SO123-II-11.152			Circuit Device Tests and Overall Functional Test
SO123-II-15.3	2	TCN 2-4	Preparation, review, approval, and distribution of the temporary system alteration and restoration Form SO(123)335

Procedure	Revision		Title of Document
S0123-V-4.16	4	TCN 4-9	System pressure testing
S0123-V-5.13	2		Site problem report (SPR)
S0123-VII-3	9		ALARA job review
S0123-VII-8.10	1		Radioactive waste maintenance program
S0123-VII-9.3	5		Reporting radiological incidents
S0123-XI-2			Procurement Document Control
S0123-XI-1.1			Blanket purchase order utilization
S0123-XI-3.5			Handling storage of hazardous materials
S0123-XI-1.0			Issue/Purchase order requisitions
S0123-XI-2.1			The three level procurement system
S0123-XI-3.2			Storage of quality-affecting items
S0123-XI-3.6			Receiving of material and equipment by SONGS warehouse
S0123-XI-3.0			Control/use of material-handling equipment
S0123-XIII-2.201	0		Hazardous waste temporary storage facility
S0123-XIII-2.202	0		Hazardous waste manifest and transfer
S0123-XIII-12	0		Control of ignition sources
S0123-XV-5	2		Nonconforming material, parts, components
S0123-XV-5.1	0		Temporary modification control
S0123-XV-10.0	0	TCN 0-1	Multiple work items against a single work authorization
S0123-XV-17	0		Hazardous waste management program
S0123-XV-18	0		Mixed waste guidelines
S0123-XVI-1	1		Confined space or confined area entry
S0123-XVI-1.0	0		Eye and/or face protection
S0123-XVI-2.0	0		Safe practices for storage and handling of compressed gas cylinders
S0123-XVI-8.0	0		Care and use of head protection
S0123-XVI-10.0	0		Proper use of safety straps, belts, lanyards, and lifelines
S0123-XVI-12.0	0		Safe use of aerial lift devices and work platforms
S0123-XVI-15.0	1		Chemical handling and storage
S0123-XVI-18.0	0		Hearing protection
S0123-XVI-19.0	0		Site industrial safety inspections
S0123-XVII-5.3	0		Control of problem equipment
S01-210	1		Condensate and feedwater
S01-260	1		Feedwater control system
S01-580	1		Safety injection, recirculation, and containment spray system
S01-I-4.4	3	TCN 3-4	Breakers - Westinghouse Type DHP 4KW Switchgear Breaker Inspection, cleaning, lubrication, adjustments, tests
S01-I-4.60			Annual Fire Detector Preventive Maintenance
S01-I-6.59	1	TCN 1-8	General air operated valves - valve and actuator overhaul
S01-I-8.164	0	TCN 0-5	Reactor coolant pump motor every third refueling preventive maintenance
S01-I-9.14	0	TCN 0-5	Breakers - Westinghouse Type DB-25 circuit breaker inspection, lubrication, adjustment and test

Procedure	Revision	Title of Document
SO1-I-9.15	0 TCN 0-1	Breakers - Westinghouse Type DB-25 circuit breaker inspection, lubrication, adjustment and test
SO1-II-1.80		Test Valve PT-1102A
SO1-XIV-1	1	Unit-1 fire protection system pre-outage plan
SO1-XV-3	3	Technical Specification surveillance program implementation
SO23-212	2	Main feedwater system
SO23-240	1	Condensate system
SO23-260	1	Main feedwater pump, turbine, and turbine controls
SO23-740	2	Safety injection, containment spray and shutdown cooling system
SO23-II-1.1.4		PPS Channel D 31 Day Surveillance
SO23-XIII-1	2	Units-2/3 fire protection system outage plan
NGS-JS-004		Jurisdiction Statement
E&C 37-30-63		Development, Issuance, Revision and Cancellation of the Document Package to establish the Environmental Qualification (EQ) of Electrical Equipment listed on the EQ Master List for SONGS 1, 2 & 3.
E&C 24-10-16		Development, Review, Approval and Release of SCE Design Change Packages (DCP) and Assembly with Proposed Facility Changes (PFC) Songs 1, 2 & 3.
E&C 24-10-15		PCW initiated to provide provisions to support processing PFCPs when a requested Technical Specification change has not been approved by the NRC.
E&C 24-10-21		Preparation, Review, Approval and Release of the Field Change Notices for Issue to Construction/Startup Maintenance without an SCE Design Change Package SONGS 1,2,3.

E&C DRRM, Design Review Responsibility Matrix - SONGS 1, 2 & 3.
E&C DRADM, Document Review and approval distribution matrix.

TQAM 1-I — Environmental Qualification of Equipment.

SCE Accident Prevention Manual.

MAINTENANCE ORDERS AND ASSOCIATED RECORDS

MO 8904140200 "Replace pump casing gasket and suction flange gasket (containment spray pump no. 1)".
MO 89042990000 "Boric acid leak...from blank flange..."
MO 89052377000 "...removal/reinstallation of mechanical seal leakoff line".
MO 89042997000 "Disconnect electrical power to motor to allow for repair of pump casing gasket".
MO 89042998000 "Provide I&C assistance by disconnecting bearing sensors".
MO 881111516 "PPS Channel D 31 Day Surveillance, SO23-II-1.1.4
MO 89063008 "Test Valve PT-1102A, SO1-II-1.80

Work Authorization Record (WAR) No. 2-8902448 "Replace Pump Gaskets".

QA Surveillance Report SOS-064-88 (equipment status control), Feb. 18, 1988.
Maintenance Professionalism audits dated March 1 through May 30, 1989.

DOCUMENTS EXAMINED RELATIVE TO EMERGENCY LIGHTING SPECIAL REVIEW

A . Records:

1. Licensee Analysis of Units-1,-2/3 methodology for recovery from a station blackout.
2. Timeline Analysis for shedding all Unit-1 AC loads and putting the dedicated diesel into service.
3. Unit-1 maintenance surveillance records for 8-hour emergency lighting units.
4. Units 2/3 annual and quarterly maintenance surveillance records for emergency lighting.
5. Disposition of unsatisfactory conditions identified during maintenance surveillance of emergency lighting.
6. Reason for two consecutive quarterly test failures for emergency lighting Unit-No. 3XJ1L8E15.
7. Disposition of NCR No. SO1-P-6631 for Unit-1 control room emergency lighting.
8. Criteria for maintaining emergency lamp lighting orientation.
9. Emergency lighting adequacy to support the establishment of shutdown cooling by locally providing power to the shutdown cooling inverter supply valves at trains C and D 480V MCC breakers located on the 50 foot level of the Auxiliary Building.
10. Emergency lighting adequacy and timeline analysis for degassing the turbine generator (hydrogen removal) during station blackout.
11. Preoperational test results for 8-hour battery pack emergency lighting (DCP No. 3341.09TE test results).
12. Prioritization of emergency lighting corrective maintenance repairs.
13. Emergency lighting system proposed Technical Specifications.
14. Failure analysis for Unit-1 control room 8-hour emergency lighting system.
15. Emergency lighting system impairment history.
16. Emergency lighting electrical design specifications.
17. NPRDS or other (SOMMS) trending of emergency lighting system deficiencies.

18. Open maintenance order Nos. 88082976000 and 8809005000 associated with NCR No. SO1-P-6631.
19. Open maintenance work order Nos. 89030257000 and 89030257001 associated with inoperable emergency lights at the Unit-1 dedicated diesel start panel.

B. Emergency Lighting Unit-1 Plant Layout Drawings (UFHA Revision-4)

5182506-2, Figure 8A,	Containment/Turbine Bldg., Sheet 4/4 El. 14'
5182507-2, Figure 8B,	Containment/Turbine Bldg., Sheet 4/4 El. 35'-6"
5182508-1, Figure 8C,	Reactor/Auxiliary-Building/Intake Structure Sheet 4/4 El. 20'-6"
5182509-1, Figure 8D,	Diesel Generator Bldg., Sheet 4/4 El. 20'-6"
5201229-1, Figure 8G,	Yard Zones, Sheet 3/3 El. 20'-6"

C. Emergency Lighting Unit-1 Electrical Diagrams (SCE/SONGS)

453535-1,	Control Room Ceiling
568522-36, Sheet 1	Lighting Distribution Panel L5
568523-29, Sheet 2	Lighting Distribution Panel L5
5102172-15	120-208 Volt Lighting Switchboard
E17N-1540SH17/5102173-24	125 Volt DC System
5173475-1	Control Room Ceiling Details
5191979-2	Dedicated Shutdown

D. Emergency Lighting Unit-2 Plant Layout Drawings (UFHA, Revision-4)

UFHA Figure 8-6	Auxiliary Building Control Area, El. 30'
UFHA Figure 8-7	Auxiliary Building Control Area, El. 50'
UFHA Figure 8-8	Auxiliary Building Control Area, El. 70'
5182507, Figure 8B	Containment/Turbine Building, Sheet 4/4
5182508, Figure 8C	Reactor Bldg./Auxiliary-Bldg./Intake Structure, Sheet 4/4
5182509, Figure 8D	Diesel Generator Building, Sheet 4/4
5201229, Figure 8G,	Yard Zones, Sheet 3/3

E. Emergency Lighting Unit 2/3 Electrical Diagrams (SCE/SONGS)

35535-2	Control Room Plant Luminous Ceiling
30164-22	480V MCC
30162-21	480V MCC
30177-20	N-1E 125VDC Distribution Panels
FGDE-2053-1	Lighting Panel 2LP35/3LP35
30150-9	208/120 Volt Lighting Distribution Bus E02
30151-7	208/120 Volt Lighting Distribution Bus L01
30312-4, Sheet 1	Elementary Diagram, Auxiliary Train B Power Feed For Essential Lighting Panel 2LP35
30312-2, Sheet 2	Elementary Diagram, Auxiliary Train A Power Feed For Essential Lighting Panel 2LP35
30199-5	Elementary Diagram, Auxiliary 4.16 KV Bus

F. Units 1 and 2/3 Operation, Abnormal Conditions, and Emergency Procedures

SO1-1-60 Loss of All AC Power
SO1-1-61 Loss of All AC Power Recovery
SO1-2.7-2 Plant Shutdown Using the Dedicated Shutdown System
SO1-XIII-22 Annual 8-Hour Emergency Lighting System Surveillance
SO23-1-1 Instrument Air System Operation
SO23-2-17 Transfer/Aligning CCW Pump P-025 to Train A or Train B
SO23-6-17.1 Non-Class 1E 120VAC Instrument and Control Power
SO23-12-7 Loss of Forced Circulation/Loss of Offsite Power
SO23-12-8 Emergency Operating Procedure, Station Blackout
SO23-13-7 Loss of Component Cooling Water or Saltwater Cooling
SO123-XIII-53 Quarterly 8-Hour Emergency Lighting System Surveillance

APPENDIX H

I. OVERALL PLANT PERFORMANCE RELATED TO MAINTENANCE

1. DIRECT MEASURES

The team consensus was that this element was functioning well.

Direct measures of plant performance associated with maintenance were evaluated from data relating to performance indicators compiled by the NRC performance indicator program, data reported by the licensee in monthly operating data reports to the NRC, NRC SALP reports and licensee internal reports on performance goals and indicators. From the above sources, the following principal direct measures of performance were evaluated to assess overall plant performance related to maintenance.

1.1 Historical Data

The team consensus was that more than minimal efforts have been made in this area, and this area had desirable qualities with only a few minor areas requiring improvement. There is no distinction made, for program adequacy versus implementation adequacy, in rating this area.

The team reviewed the historical data for all units dating back to January 1986. On the basis of this review, the team consensus was the following:

The STRENGTHS noted in this area included:

a. The effort and success in significantly reducing plant trips for Units 2 and 3 were due, in large part, to improved maintenance practices and precautions.

b. Man-Rem exposures have decreased over the past three years and have been 10 to 50 percent below the industry mean for Collective Radiation Exposure and, in part, reflected improvements in maintenance practices.

No WEAKNESSES were noted in this area.

OBSERVATIONS:

The Equivalent Availability Factor for Units-2/3 had increased, from about 10 to 15 percentage points below the industry mean, to about 5 percentage points above the industry mean over the past three years. This trend was, at least in part, due to improved plant maintenance. Unit-1 availability has been below the industry mean for reasons other than that which is attributable to the maintenance program.

1.2 Plant Walkdown Inspections

The rating assigned by the team to this block was: Good.
The team consensus was that more than minimal efforts have been made in this area, and this area had desirable qualities with only a few minor areas requiring improvement. There is no distinction made, for program adequacy versus implementation adequacy, in rating this area.

BASIS: Walkdown of low pressure safety injection and feedwater systems and general plant tours.

The STRENGTHS noted in this area included:

a. Plant wide labeling and sign program.
b. Plant housekeeping effort was readily apparent.
c. The maintenance management walkdown program (Maintenance Professionalism Audits) was found to be an innovative tool for maintenance management to assess their program's effectiveness.
d. The Area Monitoring Program assured that QA personnel were in the field and were provided with an easy-to-use deficiency documentation program.
e. There was evidence in the team walkdowns that plant involvement in the deficient identification process was good.

No WEAKNESSES were noted in this area.

II. MANAGEMENT SUPPORT OF MAINTENANCE

2.0 MANAGEMENT COMMITMENT AND INVOLVEMENT

The overall rating of this area was: Good
More than minimal efforts have been made in this area, and this area had desirable qualities with only a few minor areas requiring improvement.

STRENGTHS were noted in the following areas:

2.1 Application of industry initiatives.
2.2 Management Vigor And Example

2.1 Application Of Industry Initiatives

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. Participation in the Reliability based PM program development (Pilot Program with EPRI) was an industry lead.
b. The assignment of responsibilities and tracking of commitments for each NRC/INPO initiative. Data on each initiative was readily accessible and retrievable.
c. Professionalism Reviews (previously known as "Audits") conducted under the Maintenance Professionalism Program (Maintenance Policy Guideline S0123-G-24) have been very effective in identifying on the job, adverse conditions - e.g., poor equipment control practices (i.e., the setting and maintaining of clearances).
d. The Maintenance Professionalism video tape on performance of a "professional" job was a strong contribution to the methodology of teaching the craft how to do the job correctly.
e. The System Cognizant Engineer program was implemented at the station and enhanced the working relationship between the crafts, planning, and the engineering groups.
f. The station's MOV Preventive Maintenance and diagnostic testing programs, coupled with in-house training, equipment acquisitions, and procedural controls, have significantly reduced MOV failures in the past two years.

The WEAKNESSES identified in this area included:

a. Licensee has been slow to develop a PM program for manual valves used in emergency situations. Maintenance of manual valves was the subject of Information Notice 86-61 issued July 1986.
b. Professionalism Review (Audit) findings were not formally tracked through to completion of required action by assigned staff.

OBSERVATIONS:

The INPO station evaluation performed in March/April 89 determined that several good maintenance practices had been implemented. The INPO

maintenance self-assessment program based on INPO 85-038, Guidelines for the Conduct of Maintenance at Nuclear Power Stations, was performed by SCE during 1987; most action items have been completed. The status of the SOER program was tracked carefully; a few closed recommendations have been reopened due to post-closure review by outside organizations (INPO). The station utilized a Human Performance Evaluation System based on guidelines of the industry. The station had permanently assigned an SCE maintenance organization member to the INPO staff for purposes of peer evaluation; however, Self Assessments had not employed the use of outside, exchange help to assist in the assessment process.

2.2 Management Vigor And Example

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. The maintenance policies manual included a core document which delineated management expectations for rising standards of excellence for maintenance.
b. A dedicated staff member was assigned to coordinate and monitor training of maintenance personnel.
c. Maintenance goals included increasing allocation of craft time to participate in training, including quality circles training.
d. The Maintenance Manager personally conducted quarterly meetings with maintenance crews, with records compiled of feedback comments.
e. Management provided resources and supported development of an extensive maintenance data base, plant electronic mail system, computerized maintenance order and procedures process, and other systems contributing to improved control of maintenance.
f. Management provided resources to participate extensively in the EPRI Reliability Centered Maintenance development program, committing to RCM development for 16 systems.
g. Numerous systems have been developed and implemented to provide feedback to management relative to performance of plant hardware, procedures and practices, and administrative/clerical performance. Every employee has a variety of mechanisms for expressing concerns and obtaining answers to questions and concerns. Some of these feedback systems incorporate monetary rewards as incentives.
h. Management has committed to improving engineering support of the plant, including maintenance, by initiating a move of the corporate engineering staff to a location closer to the site (from the Rosemead, CA. office to an Irvine, CA. location).

The WEAKNESSES identified in this area included:

a. The 1987 Maintenance Self-Assessment, in response to an INPO initiative, did not involve participation of third party reviewers to enhance the objectivity of the review.

3.0 MANAGEMENT ORGANIZATION AND ADMINISTRATION

The overall rating of this area was: Good
More than minimal efforts have been made in this area, and this area had desirable qualities with only a few minor areas requiring improvement.

STRENGTHS were noted in the following areas:

3.1 Identification Of Program Coverage For Maintenance
3.2 Establishment Of Policies, Goals, Objectives For Maintenance
3.4 Definition Of Maintenance Requirements
3.5 Conduct Performance Measurement
3.6 Document Control System For Maintenance
3.7 Maintenance Decision Process

3.1 Identification Of Program Coverage For Maintenance

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. A well documented manual of maintenance policies and practices had been developed and distributed to maintenance supervisors.
b. Authorities were defined in SCE Division Jurisdiction Statements.

No WEAKNESSES were noted in this area.

3.2 Establishment Of Policies, Goals, Objectives For Maintenance

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. The maintenance policies manual included a core document which delineated management expectations for rising standards of excellence in maintenance.
b. Company goals were prominently posted throughout the plant, along with status and trend displays; plant performance, waste generation, industrial safety goals were included.
c. Individual department goals and tasks were clearly related to general company goals, and were issued widely throughout the site, along with periodic progress reports.
d. An exceptional variety of well publicized mechanisms were established to obtain employee opinions and concerns, including nuclear safety, industrial safety, performance improvement, and any other questions which an employee may have.
e. Some feedback programs, such as the Suggestions and the PRIDE programs, involved monetary awards for constructive ideas and accomplishments. Records demonstrated that the programs were both active and productive.

f. An exceptionally structured Maintenance Professionalism Audit program was implemented, which included guidance and checklist-records, for supervisors to frequently monitor ongoing work activities at all levels.
g. Results of supervisor monthly field audits were documented in monthly qualitative trend reports issued to management, in addition to trending of the amount of such field visits actually achieved. Records demonstrated that the program was active and productive in identifying working level problems and strengthening management communications with staff.
h. The Maintenance Manager personally conducted quarterly meetings with all work crews, including question and answer sessions and documentation of concerns for follow-up actions.

No WEAKNESSES were noted in this area.

3.3 Allocation Of Resources

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. Minimal reliance was placed on contractor support required for routine maintenance.
b. Staffing levels provided 24 hours on-site craft maintenance support plus call-in duty management support if necessary. A call list was maintained for additional craft persons during non-routine hours.
c. Staffing was sufficient to permit routine scheduled training for crafts, supervision, and management. The 1989 goal for journeymen was 7.5% training time (percent of normal hours) and appeared to be achievable.
d. The worker to first line supervisor ratios appeared to provide a good span of control.

The WEAKNESS noted in this area included:

a. Maintenance planning resources appeared to require management attention to determine the cause of a large number of Maintenance Orders with noted significant deficiencies. (see ISSUES)
b. Site-wide maintenance department overtime rate exceeded 40% overall and 60% for Unit-1 during January 1989, apparently due to concurrent Unit outages.
c. Relatively high corrective maintenance backlog existed; however, the trend appeared to be downward.
d. During outages, plant staff was not sufficient to sustain training consistent with the levels attained during non-outage periods.

OBSERVATIONS:

The nuclear five year plan goals seek better efficiency and productivity, thereby, seeks to reduce resource requirements in manpower. Senior licensee management stated that manpower reductions

will not be made in areas which could reduce the quality of nuclear maintenance activities.

3.4 Definition Of Maintenance Requirements

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. The Preventive Maintenance program was undergoing a Task Force level review to modify the Westinghouse developed program (U2/3) and the historically developed program (U1) based on a technical review and evaluation of each component (147,000) against vendor recommendations. Deviations from vendor recommendations required cognizant engineer approval of the deviation justifications (expected to complete March '90). Inherent in the review was the updating and verification of all vendor technical manuals (28,000).
b. The maintenance history of plant components (SOMMS) was readily accessible and used by plant personnel, including the craft level.
c. The plant maintenance program utilized and incorporated plant and industry experience in defining maintenance requirements.
d. Technical Specification requirements were evaluated and adhered to in the maintenance process.

No WEAKNESSES were noted in this area.

OBSERVATIONS:

Source documents that could change maintenance documents/requirements were processed and technically evaluated for applicability, and tracked through to incorporation in affected documents. Maintenance requirements for preventive and corrective maintenance were clearly established. Preventive maintenance requirements included periodic, predictive, and planned maintenance.

3.5 Performance Measurements

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. Trending of INPO identified performance indicators, with quarterly comparison of the trends with industry averages.
b. The Operations and Maintenance Support (O&MS) and Station Technical divisions had 19 ongoing documented trending programs which included the following innovative programs:

    o An analysis of SONGS component failures versus NPRDS component failure analysis.

- o Electrical Character Analysis and Diagnosis (ECAD) which establishes data on electrical loop characteristics which can be used to pinpoint the location of degradations in connections or components.
- o The Redundant Instrumentation Monitoring System (RIMS), which compares redundant channels for early detection of channel calibration drifts.

c. Extensive involvement in the EPRI Reliability Centered Maintenance (RCM) program, which analyzes performance at the component level to determine the need for increased or reduced maintenance.
d. A structured program for management walkdowns of plant systems.
e. Housekeeping discrepancies are easily tracked by the licensee's E-Mail (computer network) system on daily basis.
f. Maintenance Professionalism Audits which are governed by procedures and checklists, with documented findings, for managers' interface with workers.

No WEAKNESSES were noted in this area.

3.6 Document Control System For Maintenance

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. An established and documented computer based maintenance document control system for maintenance orders.

b. An established and documented computer based system for ready access to the latest, controlled procedure.
c. Documents were found to be traceable and retrievable.
d. Cross referencing capability of computer based procedure system flagged outdated references in the equipment clearance (WAR) procedure.

No WEAKNESSES were noted in this area.

3.7 Maintenance Decision Process

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. The recent change-out of Unit-1 Nuclear Instrumentation System demonstrated management's attention to resolving maintenance and deficiencies, procedure deficiencies, etc.

No WEAKNESSES were noted in this area.

4.0 TECHNICAL SUPPORT

The overall rating of this area was: Satisfactory
Applicable elements of this program have been developed, documented, and effectively implement. Areas requiring improvement were approximately offset by better performance in other areas.

The STRENGTHS noted in this area included:

4.5 Integration Of Radiological Controls Into The Maintenance Process
4.7 Integration of Regulatory Documents Into the Maintenance Process

4.1 Established Internal/Corporate Communications Channels

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. Daily communication between maintenance, operations, and station technical was good.
b. Daily communication between onsite engineering (Station Technical) and Corporate Nuclear Engineering was good.
c. Daily maintenance status and planning meetings were conducted.
d. A computerized plant information system (SOMMS) was available to all departments and contained the status of all maintenance activities.
e. Good communications existed from maintenance to management for special equipments such as EQ.
f. The computer electronic mail (E-Mail) system was well established and used throughout the site as an effective communication tool.

No significant WEAKNESSES were noted in this area.

OBSERVATIONS:

Communications between maintenance and station technical (Cognizant Engineers) was conducted by telephone in many instances when maintenance or operations needed immediate technical support. The cognizant engineer was called into the plant to help resolve the problem. Maintenance/operations used the Station Problem Report (SPR) and Nonconformance Report (NCR) to report design and construction deficiencies and other type of technical problems which arose during maintenance or operations and could not be resolved in a short time frame. Station technical/cognizant engineering dealt directly with corporate nuclear engineering. Cognizant engineering performed minor design/changes normally requiring less than 80 hours of design time. Corporate Nuclear Engineering reviewed design performed by the station technical group for design bases, environmental qualification, and Appendix R requirements. The design in these three aspects was the responsibility of Corporate Nuclear Engineering,along with all major designs and those design/changes requiring greater than 80 hours.

4.2 Engineering Support

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The licensee has established the use of cognizant (system) engineers. Cognizant engineers were found to be knowledgeable of the status and events of their systems.
b. The licensee relied on in-house personnel for the performance the majority of engineering work.
c. Station Technical Engineering was involved in the review and disposition of all NCRs.
d. Station Technical provided good technical support with respect to Emergency Lighting issues
e. Trending programs were strong.
f. Up-front 10 CFR 50.59 reviews were performed on the disposition of NCRs which resulted in repair (a change in configuration) and accept as-is dispositions.

The WEAKNESSES noted in this area included:

a. Aggressive pursuit of aged, safety-related, Unit-1 temporary modifications was not in evidence.
b. Root cause determinations performed on many NCRs were not thorough. 67% of apparent cause determinations on NCRs were marked "other" followed by a few descriptive words such as "routine failure" or "design inadequate" (see ISSUES).
c. The disposition of the NCRs associated with the Unit-2/3 SIT tank isolation valves did not provide adequate detail for the inspection and repairs to the motor operator pinion gears (see ISSUES).
d. Corrective actions identified in many NCRs were found to address the problem symptoms and not the apparent causes (see ISSUES).

4.3 Role Of PRA in the Maintenance Process

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The potential for common cause errors has been reduced in some areas, particularly I&C, by the assignment of different crews to like maintenance items and by staggered surveillance scheduling.
b. In some completed Maintenance Orders for troubleshooting problems there has been a sensitivity for investigating the potential for the existence of common mode failures when failures have been identified.

The WEAKNESSES noted in this area included:

a. Some safety evaluations for NCRs have been overly simplistic in their assessment of safety significance.
b. There is no evidence to indicate that PRA is used as a tool in assigning priorities to maintenance items other than would result from by the time restraints for corrective actions imposed by technical specifications.

OBSERVATIONS:

SISS made a contribution to component availability by scheduling maintenances in a manner that reduces to time that systems are unavailable due to preventative and corrective maintenance activities as well as routine and post maintenance testing.

4.4 Role Of Quality Control In The Maintenance Process

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. Following a weakness identified in the Quality Assurance Program in last year's SALP, the QA organization has made an effort to have inspectors in the field involved in performance based inspections.
b. The inspection performed by QA of work performed during the May 14, 1989, Unit-2 unscheduled outage was a good example of item a. in that it focused on work important to safety and involved in-plant inspection.
c. QC had program requirements for final surveillance of the completed safety related MOs in addition to designated hold/ verification/ inspection points.
d. QC staff is notified upon commencement of each safety related work order.

The WEAKNESSES noted in this area included:

a. Although the QA organization made strides to performing in- plant inspections in October 1988, the new programs had not been incorporated into plant procedures.
b. QA did not perform trending of maintenance deficiencies.
c. QA is not involved in the review of Division Investigation Reports unless one is required by an NCR (see ISSUES).
d. Both the QC and QA inspection and audit of the work performed on the Unit 2/3 SIT isolation valves failed to adequately deal with lack of adequate instructions included in the MOs and procedures (see ISSUES).
e. The inspectors found that although QA had identified many of the same weaknesses in this report (equipment control, apparent cause determinations, explicitness of MOs), aggressive action was not taken to resolve the issues (see ISSUES).

OBSERVATIONS:

QC/QA presence was noted to be very limited for the Unit-1 RCP "A" motor maintenance activity. Although most of the work was not safety related, the performance significance of the RCP and the amount of resources used to repair the pump along with recent problems associated with the RCP work (i.e. the lifting of the RCP motor while it was bolted to the stand and the use of the wrong type of insulation material on the lube oil lines) indicate the job's importance.

4.5 Integration Of Radiological Controls Into The Maintenance Process

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. HP was found to be fully involved in the planning process as evidenced by the institution of a specific Planning and Performance Group and implementation of a computer based Radiological Work Management System.
b. Extensive training and mock-up facilities were available, including EDG, RCP, RCP seals, SG lower head, and many smaller items.
c. HP support for planned work had improved due to program improvements and recently has seldom been responsible for slowing work.
d. Annual man-rem expenditures had been reduced to less than INPO targets and ALARA goals for specific jobs and groups were consistently challenging.
e. The Radioactive Material Control Group had implemented a program for minimization of the number of square feet of contaminated area at the site.
f. All Maintenance personnel were provided a pocket-sized reference book on radiological work practices and were instructed in its use.

The WEAKNESSES identified in this area included:

a. Operational HP controls of work in progress appeared to emphasize production at the expense of good radiological work practices.
b. HP procedures appeared overly complex but were being revised.

OBSERVATION:

The team perceived that the HP program was showing some deterioration due to misplaced management emphasis.

4.6 Safety Review Of Maintenance Activities

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The proposed Safety Matrix Program and Chemical Control Program appeared to provide the potential for improvement in safety performance.

The WEAKNESSES identified in this area included:

a. Some deficiencies in safety implementation were noted in that workers did not always wear hearing protection, eye protection or hard hats when required.
b. Crane operations were not always conducted in accordance with appropriate safety procedures.
c. Job site supervision by Foremen was not always strong. Several instances of the failure to properly wear safety belts were observed.

4.7 Integration of Regulatory Documents Into the Maintenance Process

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. The San Onofre Commitment Register, SOCR, provided a data base management system for identifying and tracking of actions on commitments (e.g. NRC notices, bulletins, and generic letters; corrective actions resulting from QA audits; actions directed by site management; and responses to INPO recommended actions. Tasks in SOCR were prioritized and provided the history of actions taken.

The WEAKNESSES noted in this area included:

a. The FSAR commitment (7.2.2.3.2.2.A.3) to check for grounds on Unit-2/3 analog instrument loops for protection system circuits had not been implemented.

OBSERVATIONS:

A station blackout procedure existed, however, implementation of the procedure was not possible due to inadequacies in station emergency lighting.

III. MAINTENANCE IMPLEMENTATION

5.0 WORK CONTROL

The overall rating of this area was: Satisfactory
Applicable elements of this program have been developed, documented, and effectively implement. Areas requiring improvement were approximately offset by better performance in other areas.

The STRENGTHS noted in this area included:

5.2 Establishment Of Work Order Control
5.3 Maintenance Of Equipment Records and History

5.1 Review Of Maintenance In Progress

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The process for evaluation of Technical Specification LCOs as part of all work orders was considered strong, but one occasion of error (transposing the NCR evaluated LCO to the MO incorrectly) was noted.
b. QC had program requirements for final surveillance of the completed SR MOs in addition to designated hold/verification/inspection points.
c. QC staff were notified upon commencement of each SR work order.
d. Special equipment, M&TE, spare parts requirements were identified and integrated into the maintenance order preparation process.
e. Range and span of control for first line supervision at the craft level was very good.
f. Job site supervision was readily in evidence.
g. A strong lifted lead and jumper program and control was in evidence in the I&C area.
h. The licensee used up-to-date MOs for the conduct of maintenance; revisions, when necessary, were promptly prepared and properly authorized.
i. The exact status and location of any MO could be readily determined at any time from initiation to close-out.
j. Proper support group approvals, such as fire protection and health physics, were provided for in the MO process.
k. Housekeeping and cleanliness, and attention to seismic restraint, were well maintained at job-sites.

The WEAKNESSES noted in this area included:

a. Craft performing installation of a flywheel to RCP A motor did not perform installation per procedure, did not refer to the procedure at the job-site, and did not take steps to obtain authorization for procedural deviations where the procedure was in error or was less than the optimal method of performance. (See ISSUES)

b. Craft were observed to improperly use tools or perform at less than expected "skill-of-the-trade" level on some maintenance activities. (See ISSUES)
c. On-the-job radiological practices of the craft could be strengthened, e.g.,
   (1) Collect leaking/dripping primary water from flanges and tubing, rather than permitting to drain freely.
   (2) Minimize generation of radwaste through water collection, rather than sopping up with absorbent paper. (See ISSUES)
d. On-the-job safety practices were not always in accordance with procedural requirements. (See ISSUES)
e. Procedures lacked necessary details. (See ISSUES)
f. Procedures were not always adhered to verbatim by the craft. (See ISSUES)
g. The equipment status control procedure (clearances) permitted multiple methods of maintaining and modifying equipment status. (See ISSUES)
h. The equipment status control procedure was not always followed and properly implemented. (See ISSUES)

OBSERVATIONS:

Some procedures did not include step by step sign-off.

5.2 Establishment Of Work Order Control

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The initiation of work identification and request was readily accessible and easy to use for site personnel.
b. All work in the plant, including preventive and corrective maintenance, modifications, surveillances, etc., was controlled by a Maintenance Order with the exception of a very few, specified actions that did not affect the plant operation.

The WEAKNESSES noted in this area included:

a. Computer data base (SOMMS) features for Maintenance Order preparation included expected, relevant information, and facilitated work order completeness to provide for a well documented program, however, several occasions were noted of incomplete/improperly completed MOs. (See ISSUES)
b. Although approval reviews on initiating and close-out of Maintenance Orders were provided for and conducted, the reviews were not always substantive, and therefore errors in the MOs went undetected. (See ISSUES)

OBSERVATIONS:

Clear provisions for accomplishment of emergency work were included in the Maintenance Order process, but the priority accomplishment of critical work was such that "emergency" provisions of the procedures were not required to be implemented.

5.3 Maintenance Of Equipment Records and History

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. Historical records were easily accessible in the SOMMS computer.
b. Three of the equipment trending programs (thermography, acoustical leak monitoring, and vibration monitoring were state-of-the-art programs.
c. Historical Records were kept up-to-date on the SOMMS computer and were used by engineers, planners, and managers for trending in work order preparation.

No WEAKNESSES were noted in this area.

OBSERVATIONS:

Equipment history records were maintained in the San Onofre Maintenance Management System (SOMSS) computer, retrievable by equipment identification number. The records identified, by maintenance order number, all activity performed on the particular piece of equipment, i.e. corrective/preventive/EQ maintenance, surveillance, and construction work. Work orders could be retrieved electronically for a detailed examination of work prescribed and work actually performed.

An Acoustical Valve Leak Detection program was applied to the plant secondary side valves on a regular basis. When the program has been "proven", the licensee plans to apply it also to the primary system.

A Unit 1 Thermal Shield Movement Monitoring program assessed neutron flux to detect thermal shield (Vessel Internals) motion/movement. Also loose parts monitoring was accomplished by evaluating the signals from accelerometer attached to the reactor vessel.

A Thermography program, in use slightly over two years, used infrared survey to monitor electrical connections for loose connections, electrical insulation and printed circuit boards for deterioration, and containment spray nozzles for flow capacity.

A Rotating Equipment Vibration Monitoring program monitored/trended vibration of main station turbines, main feed pump turbines circulating water and condensate pumps, stator water pump, etc. A new addition to the testing equipment was a "Schenck", 550,000 pound hard bearing slow speed rotor balancing machine (state of the art) just received on site.

Other trending programs sponsored by the station technical division were: lube oil condition monitoring (soon to include transformer oil), IST pump and valve monitoring, etc.

5.4 Conduct Of Job Planning

The overall rating of this area was: Satisfactory
Program elements appeared to be well documented.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. SISS (SONGS Integrated Scheduling System) was beginning to positively enhance the overall planning effort for Units-2/3.
b. Man-Rem expenditures have been less than INPO target goals.
c. ALARA planning goals have been consistently challenging.
d. The planning program incorporated all attributes that normally lead to successful work planning.
e. System Cognizant Engineers were noted to be readily available and accessible to the planners.

The WEAKNESSES noted in this area included:

a. Maintenance Orders were not always prepared in accordance with procedural requirements. (See ISSUES)
b. Several field activities were observed that demonstrated inadequate planning had been performed, thus revisions had to be initiated for existing MOs and/or new MOs written. (See ISSUES)
c. Planner workload of approximately 200 MOs per planner (average), requiring varying degrees of attention (Cat 15 - 70), may have contributed to less than optimal planning observed at the job site. (See ISSUES)
d. Inadequate work plan detail was observed in several MOs, and was observed to have potentially contributed to the error (replacement of actuator bolts in CCW Mini flow valve) in adjusting the stroke of an AOV. (See ISSUES)
e. Appropriate reference material was frequently absent from MOs. (See ISSUES)
f. Appropriate post maintenance testing was not always specified in the work plan of the MOs in accordance with procedure. (See ISSUES)

5.5 Performance Of Work Prioritizations

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. A formal process existed for prioritization of maintenance orders and the priority was clearly identified on each MO.

The WEAKNESSES identified in this area included:

a. The licensee has not use probabilistic risk assessment techniques in the work prioritization methodology for corrective maintenance actions.
b. Low priority category was assigned for repairs of emergency lighting.

OBSERVATIONS:

Work prioritization was based upon two major considerations. The first was the time limits of Technical Specifications for restoring equipment to operable status, and the second was the impact upon power production. However, from a review of the backlog of open maintenance items, the priority of many deferred items reflected the desirability of completing maintenance items rather than an overall time limiting priority for completing such items; i.e., many of these items are deferred until an outage regardless of their priority assignment. Likewise, items of lower priority are completed during plant operation while items of higher priority may be deferred until outages. Because of the dual considerations involved with prioritization of maintenance, a distinction is not made that reflects the impact on plant safety for any maintenance item or that distinguishes between corrective maintenance vs. preventive maintenance items.

5.6 Maintenance Work Scheduling

The overall rating of this area was: Satisfactory
Program elements appeared to be well documented.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The SISS program, implemented in Units 2/3, was intended to level maintenance resources by moving some of the outage maintenance forward into operating periods. Additionally, SISS sought to improve component and system availability by conducting all preventive, corrective, and predictive maintenance with applicable surveillance testing, within specified system boundaries on a routine rotating basis. One of the more significant aspects of this program required 12 weeks of planning and coordination effort for every week of work. SISS meetings were held daily and required the participation of Operations, Maintenance, and Crafts.

The WEAKNESSES identified in this area included:

a. The SISS program was still somewhat developmental and had not been implemented at Unit-1, although site-wide integration remains the goal.
b. One occasion was noted in which a general foreman issued an MO to be worked which required coordinated preparation, only to discover that operations could not authorize the work due to equipment operability needs. The SISS planning process was designed to avoid this type of conflict, but failed to do so in this instance.

5.7 Establishment Of Backlog Controls

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The SISS program and the outage boundary program facilitated the reduction in the backlog of Maintenance Orders (MOs).
b. The average number of days to complete MOs had steadily decreased in all priorities over the past two years.
c. The number of overdue Preventive Maintenances (PMs) was reduced significantly during the past 2 years, to a low value of 4 percent being overdue when completed.
d. The ratio of PM man-hours to total maintenance man-hours had increased steadily from 40 to 55 percent over the past two and a half years.

The WEAKNESSES noted in this area included:

a. The CM backlog greater than 3 months old was about 58 percent and was slightly higher than the industry mean which is about 51 percent. However, for the last quarter, the non-outage CM backlog was reduced by 25 percent for MOs greater than 90 days old, and 20 percent for those less than 90 days old.

5.8 Maintenance Procedures

The overall rating of this area was: Satisfactory
Program elements appeared to be well documented.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The computer managed, real time system of procedure availability to any user was particular strength.

The WEAKNESSES noted in this area included:

a. Procedures occasionally lacked explicit detail (Unit-2/3 SIT tank isolation valve maintenance), and some occasions of erroneous sequence (Unit-1 RCP maintenance).
b. Procedures for the control of equipment were found to be confusing, incomplete, and in one case, referenced outdated procedures (see ISSUES).

OBSERVATIONS:

Licensee initiative for a procedure upgrade program was noted.

5.9 Conduct Of Post-Maintenance Testing

The overall rating of this area was: Satisfactory
Program elements appeared to be well documented.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. PMT requirements were defined in the licensee's program.

The WEAKNESSES noted in this area included:

a. Some testing was not performed in accordance with procedure, e.g., relief valve S1-GNI-PSV-311 (M089031470) Test Report Special Instructions/Precautions re: temperature. (See ISSUES)
b. Some required Post Maintenance Testing (PMT) was not specified in MOs (e.g. Quality Class 1, EQ MOVs, following maintenance on the actuators), and the decision for determination of the required PMT was deferred to the Operations Department rather than being determined by the planning department in accordance with SO123-I-1.25. (See ISSUES)
c. Some PMT specified by the MOs did not have adequate acceptance criteria (time to stroke, amount to open, etc.) to determine if valve operation was correct (e.g., M089070728001, replace 2HCV6539 actuator bolts). (See ISSUES)
d. Test boundaries for system pressure tests did not require marked up drawings or sketches to show the extent of observation required during testing for the maintenance performed. Inspectors were expected to review Maintenance Orders and "Work Performed" entries and discuss the scope of work with craft available to determine areas to check. (e.g. System Pressure Testing, SO123-V-4.16, Attachments 1 & 2, Item 11)

5.10 Review Of Completed Work Control Documents

The overall rating of this area was: Satisfactory
Program elements appeared to be well documented.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. Recovery of completed field Maintenance Orders was readily accomplished through the Corporate Data Management (CDM) group..
b. The SOMMS computer system for MO processing and control permitted location of any MO at any stage in its processing cycle.

The WEAKNESSES noted in this area included:

a. The program for the review of completed Maintenance Orders was well documented, however, several instances were noted of inadequate review of the completed work. (See ISSUES)
b. Maintenance Orders were occasionally not completed in accordance with procedure. (See ISSUES)

c. Maintenance Order Work Plans were not always adequate, and frequently lacked technical detail. (See ISSUES)
d. References necessary for work accomplishment were frequently inadequate or not applicable. (See ISSUES)
e. "Work Accomplished" and "Conditions Observed" entries on MOs were occasionally incorrect or incomplete. (See ISSUES)
f. Necessary work documentation (e.g., inspection results) was not always performed, prepared, and/or available in the MOs. (See ISSUES)
g. Portions of procedures used within the bounds of MO Work Plans, or steps of the procedure, were not always adhered to by the craft. (See ISSUES)
h. Appropriate PMT was not always specified by the MO. (See ISSUES)
i. QC/QA organizations participated in MO preparation reviews, work implementation, and/or close out review, but did not detect MO abnormalities. (See ISSUES)
j. A strong, readily accessible program (to the craft) for feed back of job-site problems was in evidence, and on one occasion it was determined that field feed back of an identified problem was corrected in the equipment data base (MO88101430). However, on several occasions feedback on procedures was appropriate, but not accomplished.

6.0 PLANT MAINTENANCE ORGANIZATION

The overall rating of this area was: Good
More than minimal efforts have been made in this area, and this area had desirable qualities with only a few minor areas requiring improvement.

The STRENGTHS noted in this area included:

6.2 Contracted Maintenance
6.4 Performance Of Maintenance Trending
6.5 Establishment Of Support Interfaces

6.1 Establish Control Of Plant Maintenance Activities

The overall rating of this area was: Satisfactory
Program elements appeared to be well documented.
Implementation was: in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. The program for identification and correction of identified maintenance requirements was strong.
b. The Professionalism Review (Audit) program was a particular example of effectively overseeing maintenance activities by supervisory and management personnel.
c. A recent program of Rework evaluation had been implemented, and licensee evaluation showed that rework ran at 2.2 percent.
d. A computerized procedure control system made the latest revision very accessible to all users, and programs were used to resolve problems encountered by error or oversights in MO procedures or Work Plan steps.

e. Job specific qualifications were utilized to determine craft assignment to work plans.
f. Controls for materials used in the maintenance process was strong, including spare parts and consumables. Bagging and tagging of materials of the job was in evidence. Numerous programs for re-enforcing worker accountability were in evidence in the maintenance department.

No significant WEAKNESSES were identified in this area.

6.1.1 Control of Mechanical Activities

The overall rating of this area was: Satisfactory
Program elements appeared to be well documented.
Implementation was: in place, but could be strengthened

The STRENGTHS noted in this area included:

a. Tool and part laydown areas were conspicuous by the presence of a "tablecloth" for segregating parts and tools.

The WEAKNESSES noted in this area included:

a. Although a strong program existed for the update of vendor technical manuals, it was observed that MOs did not always reference or utilize appropriate manuals and/or drawings to support the intended work.
b. Inadequate work plans and/or worker skills contributed to potentially adjusting stroke on an Air Operated Valve improperly.

OBSERVATIONS:

Maintenance procedures were prepared in accordance with a writer's guide procedure.

6.1.2 Control of Electrical Activities

The overall rating of this area was: Satisfactory
Program elements appeared to be well documented.
Implementation was: in place, but could be strengthened

The STRENGTHS noted in this area included:

a. Periodic testing of emergency lighting systems exceeded normal industry standards.
b. The electrical shop received daily flagging of measuring/test equipment due for calibration.

The WEAKNESSES noted in this area included:

a. Failure to identify applicable sections of procedures to be used under some work orders (MOs).
b. Data required by procedures was not always included in work plans:

- Required functional tests not in some MOs, thereby defaulting to control room and equipment clearance (WAR) process to assure proper testing;
- Required data from MDRF (and thus failure to perform/record results of work required);
- Requirement for tailboard briefings prior to work;
- NCR reference.

c. Requirements incorrectly entered in Maintenance Order:
- Mode restraint;
- REP requirements;
- Identified applicable work procedures;
- Accurate description of problem.

d. Ineffective planning walkdowns were demonstrated by interferences discovered during work performance.

6.1.3 Instrumentation and Controls Maintenance

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. Units-2/3 use of the Excel Program (Macintosh) for scheduling MOs facilitated maintenance planning on a daily basis as well as for selecting higher priority items that may be completed during mini-outages.
b. The I&C planning group for Unit-2/3 was located in the same area as the I&C Maintenance supervision and technicians. This arrangement promoted a close working relationship between maintenance planning and implementation that may reduce the need for MO revision and rework.
c. The Unit-2/3 policy of annotating MOs with the assigned (responsible) crew member(s), as well as subsequent supervisory review of completed MOs, facilitated tracking MO status within the I&C maintenance organization.
d. The call-up and printout of vendor manual data and procedures at the time of initiating maintenance activity provided assurance that the latest update of the vendor manual was used.
e. Test procedures made extensive use of verification checks to assure equipment and systems were returned to service following maintenance and surveillance testing.
f. Configuration controls on temporary jumpers and similar devices was particularly strong in the this area.

The WEAKNESSES noted in this area included:

a. Work practices, in removing caps from instrument test connections, allowed other (unintended) Swagelock fitting to become loose.

6.2 Contracted Maintenance

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was not sufficiently evaluated to determine a conclusion; (Very little plant maintenance was contracted to outside firms.)

The STRENGTHS noted in this area included:

a. The only contractor personnel performing craft level work in the plant during normal operation were the HVAC crew, which had been with the plant since construction, and a few hold-over radiological controls technicians from recent outages.
b. Contractor personnel received the same training and met the same qualification requirements as SCE personnel in the plant.
c. Contractor personnel were required to perform to the same level of expertise, and had equivalent responsibilities, as SCE personnel.
d. Based on review of contractor performed Maintenance Orders, the inspector concluded that contractors were implementing SCE MO programs in a responsible manner.
e. Contract worker accountability for performance was the same as for SCE personnel.

No WEAKNESSES were noted in this area.

6.3 Establishment Of Deficiency Identification and Control System

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. Program for the identification of plant equipment deficiencies was well defined, accessible, and used by all levels of plant personnel.
b. Engineering is involved in the review and disposition of all NCRs.
c. Up-front 10 CFR 50.59 reviews were performed on the disposition of NCRs which resulted in repair (a change in configuration) and accept as is dispositions.

The WEAKNESSES noted in this area included:

a. Root cause determinations performed on many NCRs were not thorough. 67% of apparent cause determinations on NCRs were marked "other" followed by a few descriptive words such as "routine failure" or "design inadequate" (see ISSUES).
b. Apparent cause determinations were not always descriptive enough to establish what the apparent cause was (see ISSUES).
c. Corrective actions identified in many NCRs were found to address the problem symptoms and not the apparent causes (see ISSUES).
d. Corrective action was not taken in a timely manner to address emergency lighting problems (see ISSUES).

e. Old temporary facility modifications had not been adequately addressed in a timely manner.
f. The licensee had not taken aggressive action to address whether thread engagement was a generic problem in all Units (see ISSUES).
g. Corrective actions with respect to Equipment Control have been slow (see ISSUES).
h. The disposition of the NCRs associated with the Unit-2/3 SIT tank isolation valves did not provide adequate detail for the inspection and repairs to the motor operator pinion gears (see ISSUES).
i. The disposition of an instrumentation (PPS) loose cable connector NCR involved incomplete technical evaluation. (See ISSUES)
j. QA was not involved in the review of Division Investigation Reports unless required by an NCR nor was QA trending maintenance deficiencies to determine programmatic deficiencies (see ISSUES).
k. Both the QC and QA inspection and audit of the work performed on the Unit-2/3 SIT isolation valves failed to adequately deal with lack of adequate instructions included in the MOs and procedures (see ISSUES).
l. Entries on the NCR forms were not always correct, complete, and/or appropriate (not per requirements of SO123-XV-5).

OBSERVATIONS:

The licensee had a multiplicity of deficiency identification systems which were not related or reviewed in a cohesive manner. No one group reviewed the effectiveness of all these systems. It would appear that this situation could lead to corrective actions "falling in the cracks" and encumbers management oversight of plant deficiencies.

6.4 Performance Of Maintenance Trending

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. Two operations/maintenance-support monitoring/trending programs, RIMS and ECAD, were state-of-the-art programs.
b. The Maintenance Order trending of equipment failure report incorporated the INPO Component Failure Analysis Report, which utilizes the NPRDS Database, and thereby identifies SONGS equipment with high failure rates compared to industry averages.
c. Nineteen well defined, excellent trending programs were in place or being implemented to improve operation and maintenance at the three SONGS units.

The WEAKNESSES identified in this area included:

a. The Reliability Trending Report (First Quarter, '89) included engineering conclusions that are not well founded on sound engineering judgement, such as, "end of life, wear out, etc."

OBSERVATIONS:

A Maintenance Order Trending program utilized the SOMMS computer to identify components and systems with higher maintenance activities during the trending period (quarterly). The program included the use of the INPO Component Failure Analysis Report (CFAR) which utilizes the NPRDS database to generate this report. The CFAR looks at a set of 88 components and reports only those with a high failure rate compared to industry. After the CFAR reports were analyzed, the O&MS group issued a quarterly report to station technical, maintenance, and other appropriate station organizations for further analysis and resolution.

An Instrument Out-Of-Tolerance program ("Quality Affecting") utilized Technical Specification surveillances results of electrical components for a quarterly review of long term trends. NCRs were generated to evaluate and correct components identified as problems.

A Redundant Instrument Monitoring System (RIMS) was developed to monitor the calibration status of selected redundant instruments installed in Units 2/3. The system provided on-line monitoring of the calibration of selected instruments with a high degree of accuracy. The system identifies instruments whose performance is anomalous and tend to drift out-of-calibration. This units-2/3 program is state-of-the-art and licensee plans were proceeding to adapt the program to Unit-1 during the next refueling outage. The RIMS system demonstrated genuine initiative by the licensee in developing this program. The RIMS program is the only one of its kind in this country's nuclear power industry.

A unit-1 Electrical Character Analysis and Diagnosis (ECAD) system characterizes the ability and integrity of critical circuits to deliver signals through cables and connections to their respective end devices. Maintenance is presently collecting ECAD data base through SOMMS maintenance orders, which will facilitate identifying problems such as deteriorating circuit insulation, moisture intrusion, faulty circuit splices, loose termination, corroded technical connections, etc. The licensee stated that this system will be adapted to Units-2/3 during their next refueling outages. SONGS was the first U.S. nuclear plant to purchase and install an ECAD system.

6.5 Establishment Of Support Interfaces

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. The cognizant engineer program was perceived as strong because of the observable presence of the engineers in the field.
b. Automatic decisions by a computer, for notification and required presence of organizations such as QC and Health Physics, enhanced the support provided to maintenance by these organizations.
c. The existence of the Operations Equipment Control Center for preparing clearances effectively assisted maintenance personnel.

No WEAKNESSES were noted in this area.

OBSERVATIONS:

The SOMMS computer system appeared to be the principal mechanism for communications; terminals were available to various groups. The computer system tracks corrective maintenance order, preventive maintenance orders, maintenance surveillance testing, procurement of materials, etc. This system facilitates communication among the above groups. Other support interfaces with operation maintenance, and technical support are the E-Mail, the station problem report, the nonconformance report, and the approval and sign-off chains which the different maintenance and associated documents must undergo. Interfaces with the three groups and nuclear engineering located in Rosemead was controlled by station technical support, and is considered good.

7.0 MAINTENANCE FACILITIES, EQUIPMENT AND MATERIALS CONTROL

The overall rating of this area was: Good
More than minimal efforts have been made in this area, and this area had desirable qualities with only a few minor areas requiring improvement.

The STRENGTHS noted in this area included:

7.1 Provision Of Maintenance Facilities and Equipment
7.2 Establishment Of Materials Controls
7.4 Provide Control and Calibration Of Meter and Test Equipment

7.1 Provision Of Maintenance Facilities and Equipment

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. Warehouse facilities were state-of-the-art, computerized, and well maintained, e.g. packaging capability was absolutely designed to prevent any damage to spares.
b. Extensive training and mock-up facilities were available, including EDG, RCP, RCP seals, SG lower head, and many smaller items.

No WEAKNESSES were noted in this area.

7.2 Establishment Of Materials Controls

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. A Phoenix computer program had been developed to train procurement agents for the selection of Qualified Vendors, etc.
b. The warehouse facilities were state-of-the-art, computerized, well-maintained; e.g. packaging capability was absolutely capable of preventing any damage to spares.
c. The materials program was well established.
d. The system had significantly improved in its ability to provide craft the appropriate materials.
e. Improved craft confidence in material support has resulted in reduction of excessive material requisitions and demands.
f. Monitoring of spare parts inventory was very closely controlled.
g. The licensee has actively participated in development of a revised shelf-life program for the industry (EPRI).
h. Special storage for combustibles has been implemented to reduce fire hazards.

No WEAKNESSES were noted in this area.

OBSERVATIONS:

The warehouse receiving had a modern laboratory, with some very sophisticated equipment to verify materials being received. Also, a unique Phoenix Procurement Program was recently implemented for training procurement agents in the identification and selection of qualified suppliers.

A computer program for maintenance of spare parts utilized the materials management system and had links to the Corporate Document Management system (where Technical Specifications were maintained) and to the SOMMS system (which included equipment identification, location, number of components, etc.) The program maintained minimum/maximum levels of spare parts, i.e. when the minimum level is reached, re-purchase is automatically initiated. Inventory trending was utilized to determine usage, and stock levels were evaluated monthly. The program had many additional innovative features.

7.3 Establishment Of Maintenance Tool and Equipment Control

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

The STRENGTHS noted in this area included:

a. Tool room operating procedures had just been published but were not yet fully implemented.

The WEAKNESSES identified in this area included:

a. There was no formal program for identification of speciality or capital tools, necessary for specific Maintenance Orders.

b. The capability to sort the present tool inventory by type was not available.
c. There was no formal recall or return program for speciality or capital tools.
d. Future tooling needs were based on educated guessing by the cognizant tool room supervisors, thus the system had defaulted to ordering many more tools than are necessary.

OBSERVATIONS:

Non-contaminated tools had been effectively marked and numbered but the marking and numbering of contaminated tools had not been completed. A Tool Inventory Management System was under development, which appeared to be commensurate with alleviation of present programmatic weaknesses.

7.4 Provide Control and Calibration Of Meter and Test Equipment

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. Thorough documentation/tracking of each piece of M&TE for each MO.
b. The program for control and calibration of M&TE was comprehensive and computer based.
c. A program for inclusion of the specific calibration characteristics of each piece of M&TE into the computer data base was approximately half complete.
d. Storage, issue and recall programs appeared strong and included recovery actions for each item as they become due for calibration.
e. A report of calibration failures was routinely issued.
f. Procedures provided for identification of all uses of each failed tool, evaluation, and repeat performance of work (if necessary).

No WEAKNESSES were noted in this area.

OBSERVATIONS:

The crafts were not always able to perform immediate post work operational checks of torque wrenches, due to the need of HP to verify the tool free of contamination prior to its return to the Hot Tool Crib.

8.0 PERSONNEL CONTROL

The overall rating of this area was: Good
More than minimal efforts have been made in this area, and this area had desirable qualities with only a few minor areas requiring improvement.

The STRENGTHS noted in this area included:

8.2 Provide Personnel Training
8.3 Establishment Of Test and Qualification Process
8.4 Assessment Of the Current Personnel Control Status

8.1 Establishment Of Staffing Control

The overall rating of this area was: Satisfactory
Program elements appeared to be adequately addressed.
Implementation was in place, but could be strengthened.

No significant STRENGTHS were noted in this area.

No significant WEAKNESSES were noted in this area.

OBSERVATIONS:

Procedures formalized a commitment to minimum qualification standards of ANSI/ANS-18.1, 1971 and Regulatory Guide 1.8, Rev. 1, 1975 and appeared to fully implement these standards.

The licensee appeared to have a reasonably stable work force at the craft, supervision, and management levels.

8.2 Provide Personnel Training

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. The licensee's training program is INPO accredited and exceeded INPO requirements by providing training at the supervisor and manager levels.
b. Training instructors were required to be on-site monthly for interfacing with their craft specialities.
c. The training program provided for initial and continued training for all employees, and selected training for specialized tasks.
d. One on-site maintenance training coordinator was assigned full time to the task of ensuring appropriate training was scheduled, appropriate personnel were assigned to and attended scheduled training, and that training and qualification records (including exemptions and waivers) were maintained current.
e. Feedback mechanisms existed for craft supervisors to feedback to the training department trainee and training program weaknesses.
f. Lesson plans were well developed and implemented, and emphasized hands-on training.

No significant WEAKNESSES were noted in this area.

8.3 Establishment Of Test and Qualification Process

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. An On-the-Job-Training (OJT) program was well established and functioning.
b. Qualification status was updated frequently and was readily available to any supervisor for determining job qualifications.
c. Occasions were noted where jobs did not proceed until qualification status was confirmed or exempted.

The WEAKNESSES identified in this area included:

a. One occasion was noted in which craft persons were exempted from training requirements for the deviation of a specific job. The exemption was made verbally and was not approved in writing by the Maintenance Manager, as required by licensee procedures. This appeared to be an isolated event.

8.4 Assessment Of the Current Personnel Control Status

The overall rating of this area was: Good
Program elements appeared to be well documented.
Implementation was functioning well.

The STRENGTHS noted in this area included:

a. Spot checks of craft qualification for specific tasks performed revealed no discrepancies.
b. A substance abuse program was in active use.
c. Turnover rate for craft level positions appeared to be low.

No significant WEAKNESSES were noted in this area.

OBSERVATION:

One occasion was noted where many of the "call-out" personnel were not available to support emergent weekend work.

APPENDIX I

MAINTENANCE TREE

The attached diagram is a similitude of the MAINTENANCE TREE (diagram) discussed at the exit meeting on July 21, 1989. The version used at the meeting was colored in each block, to indicate:

G	Green	Good
S	Yellow	Satisfactory
P	Red	Poor
N	Blue	Not sufficiently inspected to rate

Coloring of the blocks corresponded to the ratings indicated in each subparagraph of APPENDIX A of this report, as described in Paragraph 6 of the inspection report "DETAILS".

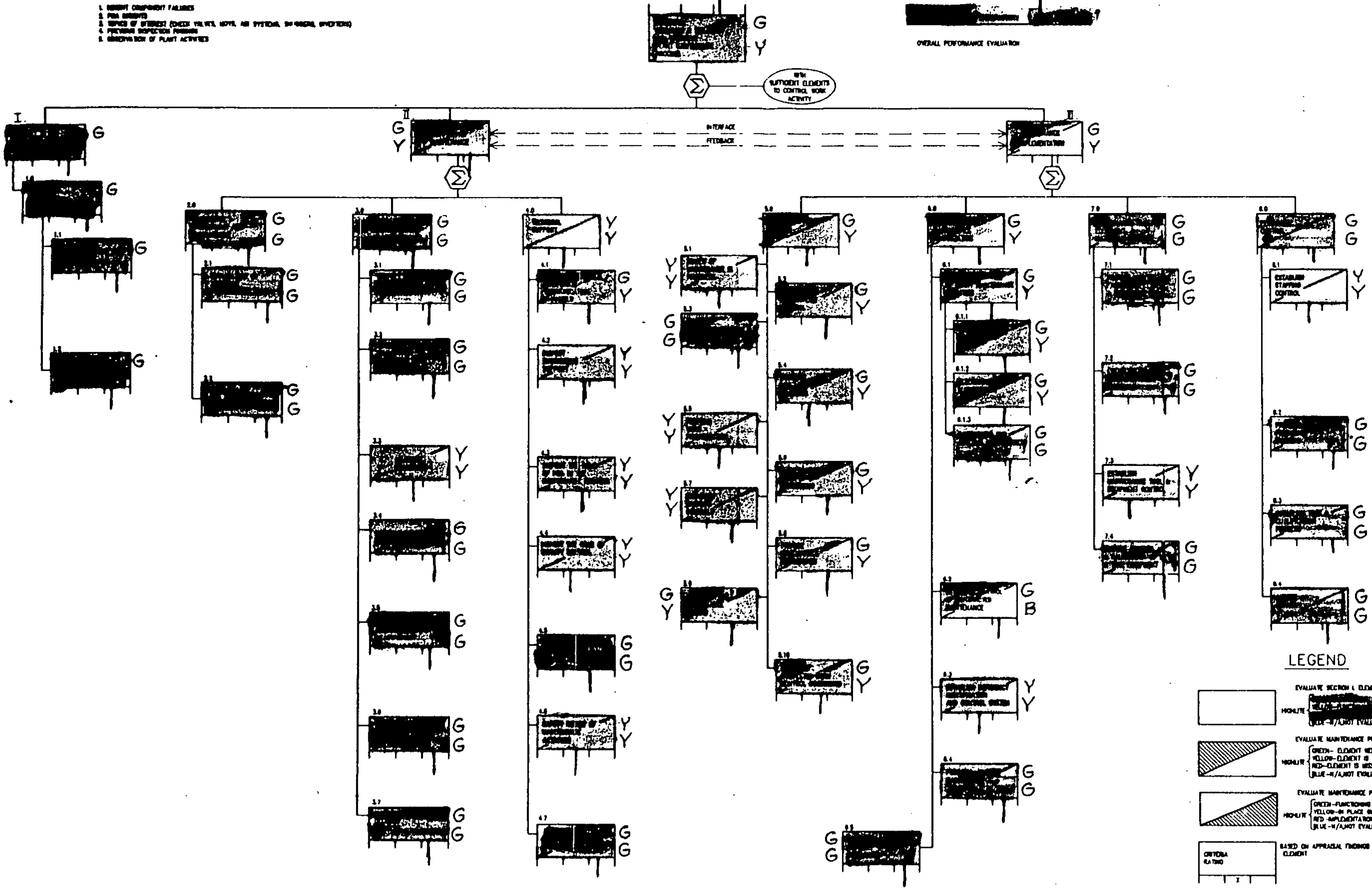
PRESENTATION TREE
MAINTENANCE INSPECTION TREE

TREE INITIATORS

1. RECENT COMPONENT FAILURES
2. PRA DERIVED
3. TOPICS OF INTEREST (CHECK VALVES, MOVS, AIR SYSTEMS, SNUBBERS, INVERTERS)
4. PREVIOUS INSPECTION FINDINGS
5. OBSERVATION OF PLANT ACTIVITIES

[redacted]

OVERALL PERFORMANCE EVALUATION



LEGEND

EVALUATE SECTION & ELEMENTS
HIGHLITE [redacted]
BLUE-N/A,NOT EVALUATED OR INSUFFICIENT DATA FOR EVALUATION

EVALUATE MAINTENANCE PROCESS ELEMENT ADEQUACY
HIGHLITE
GREEN- ELEMENT WELL DOCUMENTED
YELLOW-ELEMENT IS ADEQUATELY ADDRESSED
RED-ELEMENT IS MISSING OR INADEQUATE
BLUE-N/A,NOT EVALUATED OR INSUFFICIENT DATA FOR EVALUATION

EVALUATE MAINTENANCE PROCESS ELEMENT IMPLEMENTATION
HIGHLITE
GREEN-FUNCTIONING WELL
YELLOW-IN PLACE BUT COULD BE STRENGTHENED
RED-IMPLEMENTATION MISSING OR INADEQUATE
BLUE-N/A,NOT EVALUATED OR INSUFFICIENT DATA FOR EVALUATION

CRITERIA RATING

BASED ON APPRAISAL FINDINGS ASSIGN A RATING FOR EACH ELEMENT

NOTE: THIS DWG. IS USED IN CONJUNCTION WITH 425801, 425802, 425803, 425804, 425805, 425807 & 425808.

9/15/88
DRAWING NUMBER
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