U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/92003(DRP)

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
Palisades Nuclear Generating Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

Facility Name: Palisades Nuclear Generating Plant

Inspection at: Covert, MI

Inspection Conducted: January 6 through 10, 1992

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Inspection Summary

Inspection on January 6 through 10, 1992 (Report No. 50-255/92003(DRP)
Areas Inspected: Special modified operational safety team inspection of engineering/technical support, maintenance, safety assessment/quality verification, and operations.
Results: See the Executive Summary (attached) for inspection results.

1.0 INSPECTION SCOPE AND OBJECTIVES

From January 6 through 10, 1992, a team of seven NRC inspectors performed a modified Operational Safety Team Inspection (OSTI) at the Palisades Nuclear Generating Plant. The purpose of the inspection was to evaluate the licensee's progress in addressing problems and issues discussed in the last Systematic Assessment of Licensee Performance (SALP) report (SALP 9 - January 1, 1990, through March 31, 1991) and to provide a view of performance at the Palisades Nuclear Plant which is developed independently from the view of the normal NRC line organization (Division of Reactor Projects, Branch 2). The inspection covered the SALP functional areas of Operations, Maintenance and Surveillance, Engineering and Technical Support, and Safety Assessment and Quality Verification. The focus of the inspection was on policies and practices, communications, and management effectiveness in achieving quality performance.

2.0 ENGINEERING AND TECHNICAL SUPPORT

The team assessed the licensee's engineering and technical support of plant operations. Several interviews were conducted with systems and design engineers and engineering management personnel. In addition, the team reviewed documents related with equipment performance and design changes and conducted plant walkdowns with the licensee engineering staff.

The majority of the licensee's engineering and technical support function was performed by two organizations; the system engineering organization, which reports to the Plant Manager, and the Nuclear Engineering and Construction Organization (NECO), which reports to the Vice President - Nuclear Operations. The system engineering organization was responsible for monitoring plant operations on a day to day basis, supporting the Technical Specification surveillance program, and providing engineering support of maintenance activities. NECO was responsible for the maintenance of the plant design.

As described in detail below, the team found the system engineering program to be well established and implemented. NECO, which had been established in mid-1991 from four separate organizations, appeared to have an acceptable program. It was difficult to gage the effectiveness of NECO since it had been so recently established.

2.1 <u>Support of Engineering to Operations and Maintenance</u>

2.1.1 <u>System Engineering</u>

The system engineering program, which was established in the mid-1980's, was mature and well implemented. The team noted the following strengths in its review of the program:

- The system engineers were active and involved in the performance of assigned systems and communicated effectively with operations and maintenance.

- Responsibilities were clearly established for plant problem reviews, performance trending, and procedures reviews. Formal programs which delineated these responsibilities had been implemented.

- The systems engineers demonstrated a high degree of system ownership and organization. All the system engineers interviewed were easily able to demonstrate the current status of maintenance work, design work, problem reviews, and temporary modification.

- System engineer qualifications had been established and appropriate training was provided and tracked.

- Operations and maintenance personnel concurred that system engineers were involved in daily plant operations.

During a walkdown with one of the system engineers, the team observed that an area of the auxiliary feedwater pump room was cordoned off with caution tape with a sign stating: "Caution Falling Concrete." The system engineered explained, and it was visibly apparent, that a concrete beam above the area was spalling. There was no recent evidence of this occurring. The team questioned whether this had been reviewed as a seismic hazard. Specifically, auxiliary feedwater pump low suction pressure switch PS-741 DD was located directly below the spalling area. The licensee committed to pursue this concern. The failure of the licensee to recognize and address this aspect indicated that there may be a lack of sensitivity to seismic issues.

The team identified that backup system engineers had not been consistently established for all systems. The lack of a formally identified and trained backup could provide unnecessary confusion and delays during the response to a plant problem. The licensee was encouraged to review this aspect of their program.

2.1.2 Engineering Support to Maintenance

The system engineering program supported plant maintenance in two area:

- The trending of system performance, identifying equipment problems.

- The support of the planning of maintenance activities.

Trending of system performance is discussed in section 2.1.3.

With the exception of some electrical maintenance, the system engineers provided the engineering support for maintenance activities. This included the determination of appropriate preventive maintenance activities and the development of procedures for complex preventive and corrective maintenance.

Maintenance personnel interviewed indicated that the system engineers were involved to a high degree, often witnessing non-routine maintenance tasks. System engineers interviewed demonstrated knowledge and accountability for current maintenance work and procedures.

2.1.3 Trending

The licensee demonstrated a strong system performance trending program. Procedures required that system engineers develop a trending program for appropriate system parameters. On a quarterly basis these trends were submitted to a coordinator who compiled a report for all systems. The compiled report had a large distribution, including the plant manager.

The strengths in the trending program included:

- In addition to typical parameters such as pump/motor vibration and performance, system parameters such as availability, operations and maintenance costs, capital expenditures, and radiological dose were trended.

- System engineers were provided some flexibility to develop appropriate trend parameters which were unique to their systems.

- The quarterly report not only provided data, it highlighted significant trends, identified the causes of these trends and described actions being taken.

The vibration monitoring program was also found to be a strength. The licensee was using a computerized system which allowed the data taken from a vibration probe to be loaded into computer storage. The computer would then automatically highlight problem areas. In addition, detailed vibration analysis could be quickly performed on a personal computer.

In addition to supporting the quarterly report, the vibration data was being used to quickly identify hardware problems. The system engineer responsible for the vibration monitoring program identified the following program benefits:

- Degradation of a service water pump bearing was identified and repaired prior to bearing failure

- Results of this program have prompted the use of laser alignment technology

- Operators have requested vibration readings on equipment that "sounded" different. The vibration readings were easily compared with baseline data to either confirm or alleviate operators concerns.

2.2 Temporary Modifications

The team found that a temporary modification (TM) program had been established and implemented. TMs were controlled by the system engineering organization. The program included a 10 CFR 50.59 review prior to the change and quarterly engineering reviews while installed.

One weakness identified by the team was the manner in which the TM were communicated to the control room. The program did not provide operators with detailed information on the TM nor formal means where this information could be quickly obtained.

The shift supervisor was required to review and log the installation of a TM. If the SS found it appropriate, a caution tag was placed on control room equipment to identify the TM. A list of TM was generated and issued on a weekly basis to the control room. The control room was not provided with the full documentation of TMs.

The team reviewed the list of TMs with the control room staff and found them to be knowledgeable of the current status of modifications. The team found that the list provided to the control room was three weeks old; however, operators appeared to be cognizant of the changes that had been made. Regardless of the status of the list, the team contends that the lack of a complete description of TMs in the control room could delay the response to problems associated with equipment affected by a TM.

The team also noted that the TM program did not appear to be consistently applied. It was observed that a TM was initiated for an RTD placed in a cable tray to monitor cable temperatures. However, modifications to provide a fan to prevent heater drain pump seal water vapor from being drafted into the pump motor and the addition of a sump pump to the AFW pump room did not have TMs.

2.3 Design Change Program

The team briefly reviewed the Design Modification program and discussed several modifications with NECO engineers. This area was reviewed in more detail by an NRC Electrical Distribution System Functional Inspection (EDSFI) conducted in December, 1991 (Inspection Report 50-255/91019(DRS)).

The design organization was reorganized in 1991. The team concluded there was insufficient information to evaluate the benefits of the reorganization. The team noted that NECO was still in the process of developing self-evaluation criteria. The benefits of this reorganization could be demonstrated during the forthcoming refueling outage, scheduled to start in February 1992.

2.4 Safety Evaluations and Engineering Resolutions

The team reviewed the licensee's program for 10 CFR 50.59 evaluations and its application in various processes. In addition, the team reviewed some of the evaluations.

The licensee's centralized review of all 50.59 evaluations was seen as a strength. The approval of the evaluations was performed by the Plant Safety Engineering (PSE) group which reports to the Plant Review Committee. The PSE was comprised of four engineers experienced in a variety of disciplines. The PSE group also maintained and updated the Final Safety Analysis Report. This was also seen as a strength since the 50.59 process should provide most of the changes to the FSAR.

With respect to training, the licensee has provided 50.59 training to the plant engineering staff, including the Shift Engineers and Shift Supervisors. This training was tracked such that the PSE group could verify that a 50.59 preparer was appropriately qualified.

The 50.59 evaluation procedure (Administrative Procedure 3.07) was consistent with NRC requirements. The 50.59 evaluations reviewed by the team were found to be acceptable.

2.5 Procurement Process and Spare Parts

The team interviewed the engineering staff and the Procurement Manager to assess the status of the procurement process.

The procurement organization was assessed internally and by the NRC in mid-1991. The licensee documented several weaknesses which were verified by the NRC team. A corrective action plan was established and being implemented at the time of the inspection.

Part of the licensee's enhancements to this program were to provide a procurement engineering staff. This function had previously been accomplished by the system engineering and design engineering organizations. Interviews with the engineering staff indicated that this had been a considerable enhancement. Additionally, the availability of parts and the procurement of equipment was not seen as a hold on maintenance and design activities.

2.6 Support To BOP Activities

The engineering organization was involved in the maintenance and improvements to the balance of plant (BOP). This was demonstrated by the following:

- A significant portion of the system engineering resources were devoted to BOP activities; the largest section in the system engineering department was the BOP section.

- Main condenser tubes were replaced with stainless steel during the steam generator replacement outage, improving condenser reliability.
- Other modifications to the secondary side, such as replacement of feedwater heaters, contributed to a 17 MWe gain, allowing the licensee to achieve several production records in 1991.
- The licensee has established a weekly BOP monitoring program of 200 parameters. This has allowed the licensee to optimize BOP thermal performance.

3.0 MAINTENANCE

The team observed maintenance and surveillance activities in progress, conducted interviews, and reviewed work orders, station procedures, and other documents to assess the licensee's efforts in the areas of post maintenance testing, predictive maintenance, maintenance procedures, backlog, and planning and scheduling.

3.1 Post-Maintenance Testing

The team assessed the license's post maintenance testing program by reviewing procedures, completed work requests and work orders, training, and conducting interviews. The post maintenance test program was described in Administrative Procedure 5.19, which defines responsibilities, determination of testing to be performed, test performance, documentation, and evaluation of results. Each maintenance superintendent (mechanical or electrical), with assistance from system engineering, is responsible for the performance of post maintenance testing by his department. The operations superintendent is responsible for coordinating test performance. The maintenance planner is responsible for determining the extent of testing to be performed. Following post maintenance testing, the supervisor responsible for the performance of the testing evaluates the data for acceptability prior to approving the results. Prior to returning the equipment to operable status, the operations superintendent ensures that the testing was properly authorized, performed, reviewed, and documented. Procedure No. 5.22, "Training and Development of Maintenance Supervisor" includes the orientation guideline review of Administrative Procedure 5.19, "Post Maintenance Testing." A review of completed work requests revealed that appropriate post maintenance testing was prescribed. In addition, the post maintenance testing following the packing of a feedwater pump seal was also observed. No problems were noted.

3.2 Predictive Maintenance Programs

The team assessed the licensee's predictive maintenance program by reviewing procedures, reports,and conducting interviews. The System Engineering Department is responsible for the execution of predictive maintenance activities, which includes thermal performance analysis, vibration monitoring and analysis, infrared thermography, lube oil analysis,and acoustic monitoring. The Systems Engineering Department is also responsible for the reliability centered maintenance(RCM) program.

Predictive maintenance relies primarily on vibration monitoring and lube oil analysis to provide input into the trending of equipment performance. Infrared thermography is used to identify valve leak-bys and steam traps. Examples of the effectiveness of the program includes the identification of a service water pump bearing failure, a resonant frequency problem on a service water pump which was eliminated by the installation of motor supports which reduced the vibration and maintenance frequency,and alignment problems between pump and motor which resulted in improved alignment techniques.

A quarterly vibration monitoring meeting is held which includes representatives from maintenance, inservice inspection, and systems engineering. A review of the meeting minutes revealed that the meetings appeared to be effective in the promotion of positive dialogue between groups for the identification of problems, prioritization of resources based upon vibration analysis, and feedback on the addition of equipment to the monitoring program.

The RCM section recently completed a pilot program which included compressed air and the diesel generators,and are currently in a transition phase in the development of a plant program. The RCM program was being performed in house by the system engineering staff. While this has the advantage of developing system engineering knowledge, it will result in a lengthy implementation process. The RCM section is also responsible for issuing the Quarterly Performance Monitoring Report which is required by Procedure EM-20. The report is intended to provide indications of component degradation, inefficient system operations, and ineffective component maintenance. A review of the report indicates that it is an effective tool in improving system performance.

3.3 Maintenance Procedures

The team reviewed maintenance procedures and verified that they were current and sufficiently detailed to perform the intended maintenance. The team also verified through interviews and observations that procedures were routinely used by the workers in the field. The systems engineering department is responsible for generating the procedure and the cognizant maintenance department performs the validation. Emphasis was placed on the mechanics of writing and validating the procedure. The preparer reviews the procedure, as a minimum, every two years for update. In the preparation phase vendor manuals are factored into the procedure, and input is solicited from the end user. Examples of the effectiveness of this method of procedure development are the reduction in job time and radiation exposure during maintenance on the control rod drive seal housings and primary coolant pump seals.

3.4 Maintenance Backlog

The maintenance backlog at Palisades appears to be properly managed and trended. The maintenance superintendent uses a formula to maintain an acceptable backlog. The formula factors in manhours, crew size, and normal running backlog to get a crew month backlog, which is an indicator of the amount of workload it takes to reduce the backlog to an acceptable size. The acceptable backlog formula was developed using the average of a four year period to develop an hourly term. When it is determined that backlog is unacceptable (approximately 28,000 man-hours), resources can be taken from the utilities' traveling maintenance crews to reduce it. The total number of all work requests is 2057, and non-outage work requests, preventive and corrective, total 984. These represent an acceptable work request backlog, based on the plant's formula. Only 50 work requests are over 90 days old which indicates that maintenance is timely and long-standing equipment problems are minimized.

3.5 Planning and Scheduling

The team assessed the planning and scheduling of maintenance by reviewing procedures, schedules, observing meetings, and interviews. In 1985 planning and scheduling was decentralized and incorporated into the departments.

The operations department planner determines the priority and outage mode of the work order. The work order is then routed to the department planner for maintenance. It is then turned over to scheduling. This organization results in more involvement and ownership in the planning and scheduling process.

The schedulers and planners attend a daily scheduling meeting where weekly and daily maintenance schedules are discussed and updated. Observations of this process noted examples of its effectiveness. The first dealt with the removal of a fuel handling area exhaust fan for maintenance, however, it was brought out by operations that new fuel was to be received at the same time and that the fan maintenance would have to be delayed. Another example involved coordination of EQ maintenance on a hydrogen monitor where it was noted that the removal of insulation needed to be scheduled in order to meet the start date. It was found through interviews that delays in starting maintenance activities were rare.

4.0 SAFETY ASSESSMENT AND QUALITY VERIFICATION

The team evaluated the safety assessment and quality verification area through review of audits and surveillances, interviews, attending licensee meetings, reviewing discrepancy reporting programs and related documents. Areas evaluated included management oversight and involvement, corrective action programs, and on-site and off-site surveillance activities, licensing submittals.

4.1 Management Oversight Activities and Accountability

4.1.1 Scheduled Management Meetings

The team attended two management meetings to ascertain the level of management involvement in station activities. One meeting attended was a monthly meeting to discuss the Operations Department's long range plans. Many issues were discussed that included the correction of several false alarms and equipment failures, excessive leakage from the Safety Injection Tank control valves, PORV and block valve maintenance, charging pump seal leakage and feed system control improvements. Good communications between system engineering, operations and design engineering (NECO) were evident. The quality and depth of the questions by the Plant Manager were also evident, particularly regarding the analysis and modeling of the feedwater control system. The team also attended a quarterly meeting convened to discuss management concerns. Subjects discussed at the meeting included potential reactor cavity seal failures and the high rate of the 2400 Vac and 4160 Vac breaker failures at the station based on an evaluation of industry failure reports.

4.1.2 Nuclear Performance Assessment Department (NPAD)

On April 1, 1991, NPAD was formed with a charter to perform the traditional QA audit function and the Offsite Safety Review function previously performed by another organization. Also, NPAD responsibilities included facilitating continuous station performance improvement by assessing current station performance with established standards. NPAD's organization includes a group of seven Performance Specialists that were organized into the seven SALP functional areas. The Performance Specialists were assigned to establish the standards, conduct assessments, and measure plant performance. The methods to be used by the Performance Specialists were still under development at the time of the inspection. An essential feature of the re-organization of QA functions includes the shifting of the quality verification activities, such as, procedure reviews and corrective actions to line organizations. Since the licensee has not yet obtained NRC approval for the new approach to QA, NPAD was still performing the in-line QA functions in parallel with the line organization. The team could not adequately assess the effectiveness of the NPAD activities that pertained to the activities of the Performance Specialists since the methods and procedures for the activities have not been fully established. The team concentrated on assessing NPAD activities in the area of audits and surveillances.

4.2 Self-Assessment Capabilities

The team reviewed the licensee's self-assessment capabilities that included audits, surveillances, peer self-assessments, industry events, and the independent safety review committee activities. The purpose of the review was to determine the effectiveness of these activities in contributing to the plant's performance and to prevent recurring problems.

4.2.1 Audits

The inspectors reviewed the licensee's audit program for scope, thoroughness, follow-up on audit findings and effectiveness. The audit reports reviewed were:

Audit No.	Dates	Subject
QA-91-04	3/18-22/91	Electrical Equipment Qualification
QA-91-10	4/29-5/3/91	Electrical & Mechanical Maintenance Activities
QA-91-18	7/8-12/91	Modification Activities

The team concluded that the audit program conducted by NPAD was performance based. The inspectors did identify a concern with a conclusion in audit QA-91-04 that pertained to preventive maintenance activities. The audit reviewed the maintenance history on two components to determine if the maintenance activities were performed when required to maintain the qualified life of electrical equipment. One of the components was determined not to have been properly maintained. Even though one of the two components reviewed by the audit was not being properly maintained, the audit report's conclusion stated that the qualified life for electrical equipment was being maintained. The team was concerned that the audit's conclusion was based on a sample of only two components, one of which was deficient. Also, the team was concerned that the audit did not expand the sample size to ascertain the scope and significance of the problem with maintaining qualified life of electrical equipment. Further, the team determined during a review of the audit checklist that a minimum of seven components were to be validated for proper qualified life. The team did note that the checklist was a guide, not a requirement, for the audit team. The audit team did issue an audit finding, Deviation Report (DR) D-OG-91-13, that identified the deficiency. The team reviewed the closed DR and had no concerns with the corrective action taken by the station.

4.2.2 Surveillances

Five recent surveillances performed by NPAD were reviewed and the team determined that the surveillance program was adequate. The surveillances were performance based and areas found deficient were further evaluated during the surveillance by expanding the sample size of the activity. An example of this surveillance approach was surveillance S-QP-91-041, performed to observe worker performance during valve maintenance activities. The surveillance identified where a worker had torqued the valve bonnet studs to torque values for 5/8 " studs when the studs installed were 1/2 ". As a result the 1/2" studs broke. Further review of the work package determined that the documentation in the package had the bonnet studs identified as 5/8" studs. However, the installed studs were 1/2 " and the worker had not identified the discrepancy. The individual that performed the surveillance reviewed ten additional valve packages and identified no further discrepancies between the valve packages and the installed valves. The use of an expanded sample to ascertain the significance of a discrepancy was a good example of performance based surveillance. The team did identify a concern with the surveillance process that the licensee has also identified and was in the process of correcting. The review of surveillance S-QP-91-037, performed to monitor operations personnel during the sampling of the Safety Injection Tanks, identified a concern. The surveillance identified that the mini-flow valve for pump, P-66A, was not verified open by the operators prior to starting the pump. Operating procedure SOP-3 required the operator to verify that the valve was open. Even though the valve was not verified open prior to starting pump P-66A, the operator did have mini-flow indication which had indicated flow through the mini-flow line. The failure to follow procedure, SOP-3, was not considered above the threshold to identify the deficiency on a corrective action document. The team was concerned that an administrative process has not yet been fully established to trend deficiencies identified during surveillances that were below the threshold of an corrective action document. NPAD recognizes the need to trend these type of deficiencies and at present has established an informal method of tracking these deficiencies that could also be used for trending. The failure to verify that the mini-flow valve was open in accordance with procedure SOP-3 was to the Operations Department for resolution. The team followed up on the deficiency and determined through discussions with operations personnel that procedure SOP-3 was revised to delete the requirement to verify the mini-flow was open prior to starting pump P-66A since the operator has mini-flow indication on the control panel and the valve was required to be locked open.

4.2.3 Self-Assessments

The team reviewed two self-assessments performed in engineering and maintenance. The licensee's self-assessment program was coordinated by the Industry Experience and Assessment group of the station's Licensing Department. The engineering self assessment was performed in early 1990 and the assessment in maintenance performed in late 1987. The team concluded that follow up action on identified weaknesses was adequate. The licensee plans to perform two self-assessments in 1992 but had not yet identified which area would be assessed. The self-assessments were conducted by team leaders from the organizations assessed in order to ensure acceptance of the findings by the organization undergoing the evaluation. Even though the assessments were peer assessments, the team concluded the assessments were of acceptable quality. These peer self-assessments were considered a viable tool for organizations to exercise ownership of an area.

4.2.4 Industry Experience and Assessment (IEA)

The team reviewed licensee follow up on potential problems that pertained to air start motors (Information Notice 89-14) and Event Report, E-PAL-92-001, and to an inadvertent opening of both personnel air locks. The review of IN 89-14 by IEA was thorough and provided a good assessment of problems with air start motors on EDGs applicable to the station. In both cases the IEA department provided the station with a thorough review of the issues.

4.2.5 Independent Safety Review Meetings (ISRM)

The team reviewed minutes of the ISRM that were conducted in 1991 by NPAD on a trial basis while awaiting NRC approval of Technical Specification (TS) changes that would formalize NPAD's role in the process. Approval of the TS change was expected during the first quarter of 1992. NPAD has written procedure NPAD-02 to establish the controls and methods for the ISRM function. The trial runs of the ISRM allowed the NPAD organization to validate the effectiveness of procedure NPAD-02 prior to assuming formal control of the independent review function described in the proposed TS change. The team reviewed ISRM minutes 91-01, 91-02, 91-03, and 91-04 and determined that the meetings appeared to address current plant issues, including the pressurized thermal shock concern with PWR reactors. The thermal shock issue was discussed in a September, 1991 meeting. The team reviewed the experience of the NPAD performance specialist that performed the ISRM function and determined the experience level was adequate.

In conclusion the team considered the licensee's self assessment capabilities as adequate to contribute to better plant performance and to prevent recurring problems. However, increased management attention was needed to ensure deficiencies identified during performance based audits were thoroughly investigated to determine significance and scope of the deficiency. Also, the team noted NPAD should review audit techniques that use limited sample size to conclude satisfactory performance in an area. The surveillance program could be enhanced by establishing a trend program for deficiencies that do not meet the threshold for a corrective document. The concept of peer self-assessments appeared to contribute to the station's goal of establishing ownership of areas by the responsible organization.

4.3 Corrective Action Programs & Root Cause Analysis

The inspectors reviewed the licensee's corrective action described in administrative procedure 3.03, Revision 7, "Corrective Action". The licensee's corrective action program consisted of Event Reports, Deviation Reports, Nonconforming Material Reports, Work Orders, and

Action Item Records. To evaluate the effectiveness of the licensee's corrective action program, the team selected LERs (Event Reports), Deviation Reports, and the activities of the Plant Corrective Action Board (PCARB) for review. The PCARB meets to facilitate prompt attention to abnormal occurrences that were significant to nuclear safety or significantly adverse to quality.

4.3.1 Licensee Event Reports

The following LERs were reviewed for adequate corrective action for the identified root cause and to identify any trends that had not been previously identified by the licensee:

LER	Description of Event
90-001	Manual reactor trip following main feed pump trip.
91-001	Trip setpoint not in compliance with Technical Specification.
91-002	Non-Qualified cable splices.
91-004	Containment air leakage in excess of Technical Specification.
91-005	Inadvertent containment isolation.
91-006	Failure to compensate for open fire barrier.
91-007	Unplanned reactor trip caused by inadequate surveillance procedure.
91-008	Core exit thermocouple inoperable greater than seven days.
91-009	Core exit thermocouple inoperable and can not be repaired.
91-015	Reactor trip following loss of a mainfeed pump.

The team determined that the corrective action described in the above LERs was appropriate for the root cause identified in the LERs. The team did identify a potential problem with communications between maintenance and the control room. The following LERs identified events where less than adequate communications contributed to the event:

- LER 91-008 described an event were a maintenance work package was in the instrumentation and control (I&C) work area approximately five days after completion of the work for administrative review after which the package was sent to the control room.

- LER 91-015 documented an event were a I&C worker dropped a pressure gauge during installation which resulted in a lower than normal reading after installation. The worker failed to notify the shift personnel of the problem with the lower than normal reading. As a result, the next operating shift noted the lower than normal reading and commenced an investigation with the system engineer. The investigation resulted in a reactor trip.

The team, in the preparation for the inspection, reviewed the previous SALP 10 report and noted that a Limiting Condition for Operation was exceeded when the control room was not informed of inoperable heat tracing. Discussion with the Maintenance Superintendent determined that the problem of not notifying the control room of the inoperable heat tracing also involved the I&C department. The Maintenance Superintendent stated that the station was aware of the communication problems with the I&C department. The maintenance department had been re-organized in 1991 that resulted in the I&C department reporting to the Maintenance Superintendent. The re-organization should preclude any future communications problems between the I&C department and the control room. The team has no further concerns in this area. The team selected LERS 91-015, 91-008, and 91-004 to verify that the stated corrective action had been appropriately implemented. The team had no concerns with the implementation of the stated corrective actions.

4.3.2 <u>Deviation Reports (DR)</u>

In the review of the licensee's deficiency report (DR) system, the team observed that neither the Shift Supervisor, nor any part of the operations staff, performed a review of DRs. The initial review of Technical Specification applicability, reportability, and equipment operability was delegated to the initiator and their first line supervisor. Subsequent review was provided by a management committee within three days.

The team considered that the lack of a timely review of TS applicability, reportability, and operability by individuals with authority and training in those areas could result in the failure to comply with TSs or the failure to make a prompt report. In addition, the decision of whether a plant problem contained in a DR should be brought to the attention of the control room is not made by the operations staff. Since the relative number of DRs is fairly low (approximately 200 per year) and many are generated by operations, the additional work load of providing a formal operations review on all DRs was not seen as overwhelming.

To assess the effectiveness of the licensee's DR process the team reviewed a printout of all open DRs and open DRs that pertained to the Auxiliary Feedwater (AFW) system and Emergency Diesel Generators (EDG).

The review of the open DRs for the AFW system and the EDGs did not identify any discernable trends. The review of the printout of all open DRs did identify a concern with two DRs, 87-032 and 89-162, issued in 1987 and 1989. DR 87-32 pertained to 1) the inability to start the AFW pumps locally when a low suction pressure trip has occurred and 2) a common power supply that supplies both the motor driven AFW pump, P8A, and the turbine driven AFW pump, P8B. DR 89-162 pertained to a potential design deficiency in a redundant safety injection signal. Both DRs were assessed by the team for untimely implementation of corrective action. Followup inspection revealed that modifications were proposed for both issues and that the modifications had been delayed for a variety of reasons over the past 3 to 5 years. The modifications are now scheduled for implementation during forthcoming refueling outages. The team concluded that while the safety significance of the delayed corrective action was minimal, management should pay close attention to corrective actions that are delayed and carefully evaluate their safety impact. The team also reviewed DRs PAL-91-016, 91-18, 91-080 and DR QG-91-013 for adequate root cause and corrective action. No concerns were identified in this area.

4.3.3 Plant Corrective Action Review Board (PCARB)

During the inspection, the station had a problem with the escape lock during a test. The problem was identified on Event Report PAL-92-001. The licensee convened a PCARB chaired by the Operations Manager after the station's morning meeting. The team witnessed the PCARB meeting. The PCARB was thorough in assessing the significance of the event and assigning additional tasks to resolve the inoperable escape lock. Consideration was focused on maintaining containment integrity and compliance with Technical Specifications. The attendance of station personnel included the system engineer and maintenance personnel familiar with the current status of the escape lock. The team concluded that the PCARB was an effective tool in the licensee's corrective action program.

4.3.4 Trending

At the time of the inspection, NPAD was still developing a formalized trend program. At present NPAD has a trending program for Deviation Reports and Event Reports. There was other trending being performed at a user level, such as the quarterly plant performance monitoring reports generated by the plant's system engineering group. The numerous corrective action documents that were in place at the station will present a challenge to the licensee in establishing and implementing a viable trend program.

4.4 Licensing Submittals

In order to reduce the amount of rework and associated delays in licensing submittals that have accumulated in the past, the licensee will establish a single point of contact to coordinate licensing submittals. This coordinator will be responsible for reviewing proposed submittals to improve the content and depth. Also, periodic meetings between the licensee' licensing personnel and NRR counterparts was being considered as a method to establish a uniform standard for high quality licensing submittals.

5.0 OPERATIONS

The team evaluated the operations area to determine the effectiveness of operations management, operations department staffing, and the scope and implementation of operations department programs. Specific areas evaluated by the team were conduct of operations, plant material condition, shutdown risk programs, and operations control of support activities. The team also conducted a system walkdown of the auxiliary feedwater system.

5.1 Conduct of Operations

The team determined that operations within the control room were conducted in a quiet, professional manner. The Shift Supervisor and Shift Engineer are stationed in an office which provides direct control over access to the control room. At no time did the team observe unnecessary personnel in the main control board area.

The team observed good operator attentiveness in the control room and a normally low number of lighted annunciators. The licensee has adopted the black annunciator board concept and appeared to be successful in maintaining it. Other positive attributes included good use of procedures and the use of a computerized, menu-driven, equipment out of service red tag system.

Through observations and discussions the team determined that the operators had a good knowledge base, good operational skills, were aware of the status of plant equipment, and used good written and oral communication practices. The licensee maintained a status board in the control room which identified components and any necessary support equipment that were in a LCO action statement. Operations management, along with other supervisory personnel, were also observed in the control room and in the plant.

Operator logs were adequate for the transfer of information during operator shift turnovers. However, the logs could be improved with more detailed information. More detail would provide the licensee with the ability to reconstruct an event at a later date without extensive personnel interviews.

Planning and control of shift activities were good. There was a daily plant activities coordination and planning meeting attended by the operations planner. The operations planner issues a shift schedule sheet and scheduled activities are listed on the shift turnover sheets. Discussions with the operator indicated that they are not overloaded or distracted by work activities.

5.2 Shift Turnovers

The operations department was kept aware of the status of plant equipment by the following methods: control room LCO status board, log entries, turnover sheets, and morning meeting notes. The team observed several shift turnovers and shift briefings. There was a good detailed oral exchange of information and status of equipment. All members of the crew were aware of the concerns in the plant at all turnovers.

The team observed several watch turnovers by the auxiliary operators (AO), toured the plant, and walked down the auxiliary feedwater system with them. These turnovers were conducted with the use of a turnover sheet. There was a very detailed exchange of information, with very thorough discussions on the status of plant equipment. For example, all crews were very knowledgeable regarding the problems with testing the emergency air lock. The logs and turnover sheets were reviewed by the on coming watch, followed by a semi-formal verbal declaration that the incoming operator now had taken control of the watch station. During one particular tour, the operator did a very good mechanical tour of the auxiliary building. However, the team noted that while the operator paid close attention to the condition of mechanical equipment, he did not pay equal attention to the status of the breakers on motor control centers and busses.

After turnover was completed for all watch stations, there was a shift meeting in the control room where each member of the crew gave an update and status of important evolutions for his watch station.

5.3 Plant Material Condition

Housekeeping and material condition in the auxiliary building were very good. Areas were well lighted, no leaks of steam, water, or oil were noted, and the amount of contaminated area was extremely small. Accessibility to areas because of security or contamination controls was not a concern when performing rounds. There were only two areas that the operator had to dress out to enter and perform his tasks. The licensee intends to recover these areas in the near future. On the other hand, housekeeping in the turbine building was somewhat below the team's expectations. The licensee acknowledged the observation and indicated that additional personnel were being hired to improve conditions in the turbine building.

Labeling of pumps and valves was very good. Orange labels and tape were used to indicate containment penetration valves and piping. Magnetic tags were used on control boards to indicate the status of a tank; if it is on fill, draining, or cross connected. The licensee does not have a program to label piping.

5.4 Safety System Walkdown - Auxiliary Feedwater

The team conducted a special walkdown of AFW with an AO to evaluate his ability to perform ONP 25.2 "Alternate Safe Shutdown Procedure". The AO was familiar with the abnormal operating procedure, and had no trouble in locating the valves that would require local operation. The following observations revealed that lighting and accessibility to valves for local manual operation should be evaluated by the licensee.

- Turbine bypass valve CV-0511 is in a pit with inadequate lighting
- CV-0522 is high in the overhead ... is inadequately lighted.
- Atmospheric steam dump valves have no provision for manual override. If valve fails shut you have no immediate way to open.
- No emergency lighting for steam dump auxiliary control panel (on the roof) where operators would be throttling AFW flow.

During the walkdown no out-of-service tags were found on the system. All equipment was found to be in the correct position and the system was well labeled. For the most part the drawing used during the walkdown was correct except for the order of some pump discharge pressure instrumentation line taps. The material condition of the system was also good. There were no health physics concerns for getting into the area or locally operating the system. Housekeeping was generally good in the area. The team does believe that the adequacy of emergency lighting should be evaluated for local operation of the system.

5.5 Shutdown Risk Management

Recent industry events have focused on the potential for accidents during shutdown plant conditions. Some analyses have indicated that the probability of an event leading to fuel damage may be as high in shutdown as during power operation. Typical technical specifications requirements for equipment operability are based on upon events which initiate during power operations. Removing safety systems from service for maintenance, modifications, or testing decreases the ability to respond to the loss of another essential system. Reduced primary coolant system inventory and high decay heat also decreased the time available to respond to an event. These concerns for safety during shutdown conditions required the licensee to perform outage work in a careful, controlled manner by the use of "system windows". Each system window takes into account decay heat removal, primary system inventory, containment closure and integrity, and electrical system availability. Resource availability, congestion in an area, ALARA concerns, and support system availability are also factored into the system window.

When primary system water level is less than the reactor vessel flange level, the licensee administratively requires that the following equipment be maintained operable to ensure shutdown cooling availability: service water, component cooling, high pressure safety injection, low pressure safety injection, and spent fuel exhaust. During an outage, the shift is routinely provided with a "Shutdown Cooling Equipment Availability Check Sheet" to ensure they are aware of shutdown cooling equipment requirements.

In addition to the system windows concept and the administrative requirements, the licensee has developed a simulator module and procedure for loss of shutdown cooling. All operators have been trained on the loss of shutdown cooling.

5.6 Operations Control Of Support Activities

The operations department has developed an effective trend program. Key plant parameters are trended against expected and unexpected transients. In many cases these trends look at the entire system or group of systems to see an overall integrated performance picture. The trends were annotated with pertinent information and were readily accessible to the entire plant. These trends provided an important communication link between the operating shifts on long range performance of their systems and ongoing troubleshooting and repair efforts. The review and subsequent actions by the operating crews and their direction to maintenance has resulted in improvements at the plant. Examples of these trends and their results include: follow up action for safety injection tank check valve leakage trends has reduced the need to write deviation reports for high level or low boron concentration in these tanks for the last four years. Trends of floor drains and sump levels has lead to radwaste leakage elimination efforts that have netted a 75 percent reduction in the quantity of liquid radwaste produced over the last four years. Trend analysis of charging pump seal leakage has allowed scheduling of maintenance at the best times to ensure that the pump is removed from service during periods when there was the least risk to plant safety. Containment system leakage trends resulted in the inspection and discovery of a main steam leak inside the containment. Component cooling system leakage has been reduced to a fraction of the leakage that existed several years ago. Primary coolant leakage in excess of one-tenth of technical specification limits is promptly investigated and repaired. The team also observed the use of core flux trends by the operators to determine when to dilute the primary system to dampen flux oscillations.

The team examined the equipment outage process, verified tag outs for adequacy, and observed the hanging of a tag-out on fuel handling building ventilation fans. The licensee has a good, menu driven, computerized out of service tagging system. The fuel handling ventilation fan tag out was adequate to perform the work and all tags were correctly placed after the equipment was placed in the required position. A weakness noted during that particular evolution was that the AO did not know the reason the fuel handling fans were being taken out of service. When questioned, operations management indicated that this was not routine; however, the team was unable to validate this through further observations due to the need for evaluation of other areas.

Overall, the team concluded that the operations department was well managed, well organized, and adequately staffed. Operators were knowledgeable, competent, and motivated. Operations programs, most notably the trending programs, were effectively implemented. Operations management was encouraged to evaluate the need for shift review of DRs and lighting and accessibility to valves for local manual operation for performing ONP 25.2 "Alternate Safe Shutdown Procedure".

6.0 EXIT MEETING

The Inspection Team met with the licensee representatives denoted in Appendix A at the conclusion of the inspection on January 10, 1992. The Team Leader summarized the purpose, scope, and findings of the inspection and the likely informational content of the inspection report. The licensee acknowledged this information and did not identify any information as proprietary.

APPENDIX A

ATTENDANCE SHEET

EXIT MEETING - JANUARY 10, 1992

NAME	TITLE
Licensee Personnel	
J. D. Alderink	Industry Experience & Assessment Administrator
R. J. Beeker	Nuclear Assessment Program Manager
T. W. Bowes	Mechanical & Civil/Structural Eng. Manager
T. A. Buczwinski	R&SA, NECo
R. J. Corbett	Senior Engineer, NECo
S. C. Cote	Property Protection Superintendent
D. R. Day	Senior Engineering Analyst
P. M. Donnelly	Plant Safety and Licensing Director
R. R. Frisch	Planning and Scheduling
C. M. Grady	Maintenance Superintendent - Planning
J. C. Griggs	Human Resources
K. M. Haas	Radiation Services Manager
R. M. Hamm	NECO Engineering
J. L. Hanson	Operations Superintendent
J. Haumersen	Maintenance Superintendent - Electrical/I&C
E. R. Van Hoof	NPAD Director
R. B. Kasper	Maintenance Manager
C. S. Kozup	Plant Safety and Licensing
J. Kuemin	Licensing Administrator
R. P. Margol	System Engineer
R. E. McCaleb	NPAD
L. A. Morse	Licensing Clerk
R. D. Orosz	Nuclear Engineering and Construction Manager
K. E. Osborne	System Engineering Manager
T. J. Palmisano	Administration and Planning Manager
J. C. Pietro	Site NPAD Supervisor
R. M. Rice	Operations Manager
L. J. Ross	Maintenance Superintendent - Mechanical
J. Schepers	NPAD Specialist
G. B. Slade	Plant General Manager
R. W. Smedley	Staff Licensing Engineer
K. A. Toner	NECo, Elec./I&C/Computer Engineering Manager
D. J. VandeWalle	NECO
R. A. Vincent	Plant Safety Engineering Administrator
S. T. Wawro	Operations Scheduling Supervisor
E. A. Zernick	NPAD Assessor
NRC PERSONNEL	
M. J. Farber	Chief, Reactor Projects Section 1A
D. J. Hartland	Reactor Engineer
J. K. Heller	Senior Resident Inspector
K. E. Johnston	Project Team
D. E. Jones	Reactor Engineer

W. J. Kropp	Senior Resident Team, Byron
R. J. Leemon	Resident Inspector, Zion
W. D. Shafer	Chief, Reactor Projects Branch 2

EXECUTIVE SUMMARY

From January 6 through 10, 1992, a team of seven NRC inspectors performed a modified Operational Safety Team Inspection (OSTI) at the Palisades Nuclear Generating Plant. The purpose of the inspection was to evaluate the licensee's progress in addressing problems and issues discussed in the last Systematic Assessment of Licensee Performance (SALP) report (SALP 9 - January 1, 1990, through March 31, 1991) and to provide a view of performance at the Palisades Nuclear Plant which was developed independently from the view of the normal NRC line organization (Projects Branch 2). The inspection covered the SALP functional areas of Operations, Maintenance and Surveillance, Engineering and Technical Support, and Safety Assessment and Quality Verification. The focus of the inspection was on policies and practices, communications, and management effectiveness in achieving quality performance.

The team assessed the licensee's engineering and technical support of plant operations. Several interviews were conducted with systems and design engineers, and engineering management personnel. In addition, the team reviewed documents related with equipment performance and design changes, and conducted plant walkdowns with the licensee engineering staff. The team examined performance in the following specific areas: engineering support to operations and maintenance, trending, temporary modifications, design change program, safety evaluations and engineering resolutions, procurement and spare parts, and support for balance of plant activities.

The majority of the licensee's engineering and technical support function is performed by two organizations; the system engineering organization, which reports to the Plant Manager, and the Nuclear Engineering and Construction Organization (NECO), which reports to the Vice President - Nuclear Operations. The system engineering organization was responsible for monitoring plant operations on a day to day basis, supporting the Technical Specification surveillance program, and providing engineering support of maintenance activities. NECO was responsible for the maintenance of the plant design. Because of the current level of inspection effort in the design area, the team chose to limit the scope of its inspection to the station's system engineer program.

The team found the system engineering program to be well established and implemented. Of particular note was the experience level of the staff, the interface between system engineers, operations, and maintenance, and system performance trending programs. Areas which warrant additional licensee consideration include the need for clear identification of backup assignments for system engineers and real-time tracking of temporary modification status. NECO, which had been established in mid-1991 from four separate organizations, appeared to have an acceptable program; however the team did not attempt to evaluate how effectively the program was implemented.

The team observed maintenance and surveillance activities in progress, conducted interviews, and reviewed work orders, station procedures, and other documents to assess the licensee's efforts in the areas of post maintenance testing, predictive maintenance, coordination of maintenance, maintenance procedures, backlog, and planning and scheduling. The team noted that the post-maintenance testing program was well-defined and appeared to be properly implemented. In the area of predictive maintenance, the vibration and oil analysis programs were well established, infrared thermography was being used although applications were limited, and reliability centered maintenance programs were in the pilot stage. Planning and scheduling of maintenance activities appeared to be effective.

In the safety assessment and quality verification area, the team evaluated the licensee's management oversight, corrective action programs, and on-site and off-site surveillance activities. Management awareness of plant activities and conditions was evident during observations of management meetings, Corrective Action Review Boards (CARB), and in-plant presence. The licensee's corrective action and root cause programs appeared to be well established and implemented. CARB meetings observed by the team had good information exchanges, clearly identified courses of action, and specified accountability for progress by individual. One weakness noted in the Deviation Report system was the lack of a timely review for Technical Specification applicability by the Operations Department. The team noted that an off-site organization, the Nuclear Performance Assessment Department, was formed to implement the peer review concept of Quality Assurance and replace the current off-site review organization. The licensee had not yet obtained NRC approval for this approach, thus NPAD was still performing traditional QA functions in parallel with the peer reviews of the line organization. The team could not adequately assess the effectiveness of the NPAD activities pertaining to the peer review process since the methods and procedures for these activities had not been fully established. The team considered the licensee's self assessment capabilities adequate to improve plant performance and prevent recurrent problems.

Operations was assessed in conduct of operations, shift turnovers, plant material condition, safety system walkdown, shutdown risk management, and control of support activities. The team concluded that operations, inside and outside the control room were routinely conducted in a professional manner by knowledgeable, well-trained individuals. Operations management was observed in the control room and the plant on several occasions; response to these visits indicated that operators were familiar with management presence. Shift turnovers were organized and well-conducted; detailed information exchanges on equipment status were noted at each turnover. Housekeeping and material condition in the auxiliary building were very good. Areas were well lighted, no leaks of steam, water, or oil were noted, and the amount of contaminated area was extremely small. On the other hand, housekeeping in the turbine building was somewhat below the team's expectations. The licensee acknowledged the observation and indicated that additional personnel were being hired to improve conditions in the turbine building. The licensee has taken a conservative approach to shutdown risk management, using an analytical approach to the decision to take systems out of service, providing simulator training for operators on loss of shutdown cooling, and statusing shutdown cooling equipment availability.

Conclusions:

The team determined that the plant was staffed by competent and knowledgeable personnel who executed their duties in a professional manner and were capable of operating the plant safely. The station's system engineer program is considered a strength; experienced, motivated system engineers have a good working relationship with other plant departments and have made a number of contributions to plant performance. The knowledge level and attentiveness of the operators is an asset, as is management involvement in daily activities. The design engineering organization and the licensee's approach to quality assurance were changing and sustained management attention to these areas is needed to ensure a smooth transition and complete implementation of the new programs.