U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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License No:	DPR-20
Report No:	50-255/98005(DRP)
Licensee:	Consumers Energy Company 212 West Michigan Avenue Jackson, MI 49201
Facility:	Palisades Nuclear Generating Plant
Location:	27780 Blue Star Memorial Highway Covert, MI 49043-9530
Dates:	March 14 through May 6, 1998
Inspectors:	J. Lennartz, Senior Resident Inspector P. Prescott, Resident Inspector
Approved by:	Bruce L. Burgess, Chief Reactor Projects Branch 6

EXECUTIVE SUMMARY

Palisades Nuclear Generating Plant
NRC Inspection Report 50-255/98005

This inspection involved aspects of licensee operations, maintenance, engineering, and plant support. The report covers the period from March 14 through May 6, 1998.

Operations

- Plant operations was challenged with continued equipment reliability issues. Specifically, main turbine stop Valve #1 and governor Valve #1 were closed and hydraulically isolated due to inadvertent partial closure and subsequent opening of turbine stop Valve #1. This resulted in placing the turbine control system in an off-normal, manual mode of operation. In addition, the licensee had previously taken a turbine generator electrohydraulic control system pump out-of-service (February 16, 1998) due to a leak in the discharge flow instrument. (Section O1.1)

- The control room access was well controlled which eliminated unnecessary distractions to the operators. Control room manning exceeded Technical Specification requirements. The plant was operated in a conservative manner while the turbine control system was in an off-normal configuration. The inspectors identified weaknesses in control room log keeping and noted that licensee management had targeted this as an area which needed improvement. (Section O1.2)

- The actions taken in response to the unknown status of main turbine stop Valve #1 were appropriate and ensured positive control of the valve. Closing and isolating hydraulic fluid to main turbine stop Valve #1 and governor Valve #1 was considered prudent in preventing a potential turbine overspeed condition that could result from a failure of governor Valve #1 to close following a turbine trip. (Section O2)

- The control room operators successfully operated the plant while the turbine control system was restricted to an off-normal, manual mode of operation. Coordination among crew members was good during those activities performed to shut down the plant for the scheduled refueling outage. The crew transferred feed to the steam generators from the main feedwater system to the auxiliary feedwater system during the plant shutdown without causing an unnecessary transient which reflected improved performance from past evolutions. (Section O4)

Maintenance

- Several examples of maintenance cleanliness and foreign material exclusion issues were identified by licensee personnel during the early stages of the outage. Individually, the identified cleanliness and foreign material exclusion issues were considered minor; however, collectively they indicated that additional management attention in this area was warranted. (Section M1.1)

- Overall, the inspectors observed, during maintenance and surveillance activities, good procedure adherence, and maintenance and radiation work practices. (Section M1.2)

- The planned work scope for the 1998 refueling outage should not be challenging for the licensee to safely accomplish. The level of planning and preparation was thorough and complete. However, the inspectors noted that some longstanding equipment problems were deferred. (Section M1.3)

- The personnel air lock Technical Specification amendment should benefit the licensee if personnel air lock operability problems arise in the future. However, the inspectors discussed with the licensee the need for maintenance and system engineering personnel to ensure corrective actions adequately address reliability of the personnel and emergency air locks due to the safety significance of these components regarding containment integrity as well as personnel safety. (Section M2.1)

- The inspectors identified that no foreign material exclusion covers were installed on the emergency diesel's generator access covers and no maintenance personnel were present to maintain positive foreign material exclusion controls. Also, the inspectors identified that inadequate procedural requirements existed for foreign material exclusion controls pertaining to electrical components which was a violation of regulatory requirements. (Section M3)

Engineering

- Engineering personnel were frequently challenged with emergent equipment reliability issues. Specifically, engineering personnel had to respond to and support emergent work pertaining to containment air locks, turbine control systems, and auxiliary feedwater flow controller operational issues. Engineering personnel responded to and supported these activities in a timely manner. (Section E1.1)

- The inspectors noted that the follow-up to correct identified deficiencies with inservice testing requirements was thorough. However, system engineering supervision relied on engineering personnel to identify errors in the IST program data base. (Section E2)

- The licensee relied on vendor representatives rather than in-house knowledge of the turbine control systems. Also, some licensee engineering personnel did not understand the operational design for the auxiliary feedwater Yokagowa flow controllers. This indicated an apparent knowledge weakness on behalf of engineering personnel regarding auxiliary feedwater flow controllers and the turbine generator control systems. (Section E4)

Plant Support

- The inspectors concluded that radiological practices observed during maintenance activities and plant daily walkdowns were adequate. (Section R8.1)

Report Details

Summary of Plant Status

The plant operated at essentially full power (99.6 percent) from the start of the inspection period until a partial closure of turbine stop Valve #1 occurred on March 17, 1998. The turbine stop valve inadvertent partial closure limited reactor power to 96 percent power until the plant was taken off-line on April 24, 1998, for a scheduled refueling outage. The plant was in hot shutdown on April 25, 1998, and placed in cold shutdown on April 26, 1998.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

Plant operators were challenged with continued equipment reliability issues. Specifically, main turbine stop Valve #1 and governor Valve #1 were closed and hydraulically isolated due to inadvertent partial closure and subsequent opening of turbine stop Valve #1. This condition resulted in the licensee placing the turbine controls in a manual mode of operation which was an off-normal lineup. Also, this condition rendered the automatic runback features associated with the turbine control system unavailable which would have required a plant trip if a substantial secondary plant transient would have occurred. In addition, the licensee had previously taken a turbine generator electrohydraulic control (EHC) system pump out-of-service (February 16, 1998) due to a leak in the discharge flow instrument. This resulted in the EHC system not having any standby pump capabilities which would have required a turbine trip if any subsequent problems emerged with the operating EHC pump.

O1.2 Control Room Observations

a. Inspection Scope (71707)

The inspectors routinely toured the control room, reviewed control room logs, reviewed system status as indicated on the control panels, and occasionally observed shift meetings. In addition, the inspectors observed control room activities while the plant was being operated when the turbine control system was in an off-normal, manual mode.

Observations and Findings

The inspectors noted that the minimum crew manning requirements per Administration Procedure (AP) 4.00, "Operations Organization, Responsibilities and Conduct," of three Senior Reactor Operators and three Reactor Operators were always satisfied. This manning augmentation exceeded Technical Specification (TS) requirements. In addition, the inspectors noted that the control room was free of unnecessary traffic and activities.

The five individual on-shift crews were combined into two crews for the outage. Each crew was scheduled to work 12-hour shifts and was sufficiently staffed to allow "extra" individuals on crew to relieve crew watchstanders. This provided on-shift management with the necessary resources to provide days off for individual crew members and to

provide coverage for unexpected absences. A shift meeting was held before each shift to discuss outage activities and scheduled evolutions. The meeting included all on-shift operations personnel as well a representative from the Work Control Center outage management team. The meeting was utilized to align resources for upcoming activities as well as to review problems encountered during the previous 12 hours.

Licensee management decided to close and isolate main turbine stop Valve #1 and governor Valve #1 following the problems experienced on March 17, 1998, when the stop valve inadvertently closed partially and subsequently reopened. This limited plant power to 96 percent. The turbine control system was placed in an off-normal, manual mode with the three remaining governor valves operating in "single valve" mode. The control room crews operated the plant in a controlled and deliberate manner without causing any unnecessary perturbations on the plant while this off-normal condition existed.

The inspectors noted that some log entries did not contain the level of detail which would fully describe the circumstances surrounding an issue. When questioned by the inspectors, control room operators demonstrated that they were knowledgeable of the details surrounding the issues by providing answers to the inspectors' questions. Based on discussions with licensee management, the inspectors noted that control room log keeping had been targeted as an area which needed improvement. Also, a condition report was subsequently generated (C-PAL-98-0795) by the licensee's Nuclear Performance Assessment Department (NPAD) pertaining to NPAD's observations regarding inconsistent control room log keeping practices. That condition report included a recommended action to review expectations regarding log keeping requirements with all operations personnel to ensure consistent information was recorded.

Conclusions

The control room access was well controlled which eliminated unnecessary distractions to the operators. Control room manning exceeded TS requirements. The plant was operated in a conservative manner while the turbine control system was in an off-normal configuration. The inspectors observed weaknesses in control room log keeping and noted that licensee management had targeted this as an area which needed improvement.

O2 Operational Status of Facilities and Equipment

a. Inspection Scope (71707)

The inspectors observed the management review board, and reviewed the applicable condition report (C-PAL-98-0424) regarding the inadvertent closure of turbine stop Valve #1. The inspectors also reviewed condition reports regarding a turbine generator EHC pump flow sightglass leak.

b. Observations and Findings

Main turbine stop Valve #1 partially closed (approximately 30 percent) from the normal full open position on March 17, 1998, while the plant was operating at 99.6 percent power. The valve subsequently went full open during troubleshooting efforts. The licensee's engineering group and vendor representatives could not definitively determine the status

of stop Valve #1 without conducting intrusive maintenance. Therefore, there was no assurance that the valve would close on a turbine trip. This could have resulted in a turbine overspeed condition if governor Valve #1 also failed to close following a turbine trip. Based on discussions between the licensee's engineering department and vendor representatives, the licensee concluded that no adverse consequences to the main turbine would occur if the turbine was operated with turbine stop Valve #1 and governor Valve #1 closed. Based on that conclusion, main turbine stop Valve #1 and governor Valve #1 were closed and the hydraulic control fluid to the valves was isolated. This turbine valve configuration limited power to approximately 96 percent until the plant was shutdown for the scheduled refueling outage on April 25, 1998. Necessary repairs to turbine stop Valve #1 were added to the scheduled outage's work scope.

In addition, the turbine EHC system was previously degraded due to removing one EHC pump from service on February 16, 1998, due to a leak in the discharge flow indicator. This resulted in the EHC system not having any standby pump capabilities which would have required a turbine trip if any subsequent problems emerged with the operating EHC pump. Licensee management evaluated the situation and decided not to conduct repairs while the plant was on-line to avoid the potential for introducing contaminants into the EHC fluid.

c. Conclusions

The actions taken in response to the unknown status of main turbine stop Valve #1 were appropriate and ensured positive control of the valve. Closing and isolating hydraulic fluid to main turbine stop Valve #1 and governor Valve #1 was considered prudent in preventing a potential turbine overspeed condition that could result from a failure of governor Valve #1 to close following a turbine trip.

O4 Operator Knowledge and Performance

a. Inspection Scope (71707)

The inspectors observed licensed operator crew performance during: 1) routine power operations; 2) plant operational activities surrounding turbine stop Valve #1 problems; 3) plant shutdown for the scheduled refueling outage; and 4) plant cooldown and initiation of shutdown cooling.

b. Observations and Findings

As a result of the main turbine stop Valve #1 problems experienced on March 17, 1998, the turbine generator controls were limited to manual. Due to the stop Valve #1 problems, governor Valve #1 and turbine stop Valve #1 were also closed and isolated which required the three remaining governor valves to operate in the "single valve" mode. This was an abnormal operating condition for the turbine. The control room crews operated the plant during this condition in a controlled and deliberate manner without causing any unnecessary perturbations to the plant.

The plant was taken off-line on April 24, 1998, for the scheduled refueling outage. The inspectors noted that the control room operators coordinated well with each other during the plant shutdown. Also, for the most part, the Control Room Supervisor provided the

appropriate amount of oversight and direction. The evolution to transfer from main feedwater to auxiliary feedwater following the manual turbine trip was accomplished without any unnecessary cooldown of the primary coolant system.

c. Conclusions

The control room operators successfully operated the plant while the turbine control system was restricted to an off-normal, manual mode of operation. Coordination among crew members was good during those activities performed to shut down the plant for the scheduled refueling outage. The crew transferred feed to the steam generators from the main feedwater system to the auxiliary feedwater system during the plant shutdown without causing an unnecessary transient which reflected improved performance from past evolutions.

O8 Miscellaneous Operations Issues (92700 and 92901)

O8.1 (Closed) LER 50-255/95003-00: Main feedwater pump transient resulting in a reactor trip. On May 22, 1998, with the plant operating at 46 percent power, both main feedwater pump turbines K-7A and K-7B tripped. While preparing to reduce reactor power, K-7A tripped. The reactor operator responded to the K-7A trip in accordance with Off Normal Procedure (ONP) - 3, "Loss of Main Feedwater." However, the 'B' steam generator level reached the high level override setpoint, which caused immediate closure of the feedwater control valve (CV-0703) as designed. This caused an immediate drop in load for turbine K-7B which subsequently tripped on overspeed. The operator then manually tripped the reactor. The cause of the event was failure of the locknut on the layshaft assembly of K-7A which allowed the layshaft gear to move down the shaft. Also, the moving gear worked against a lockwasher which failed and increased gear movement. The lockwasher appeared to have been reused.

The inspectors reviewed the actions that were taken to improve maintenance practices on the main feedwater pump (MFP) turbine. Those actions included: 1) the vendor recommended practice of a tight tolerance band between the shaft and gear was implemented; 2) the maintenance process no longer allowed reusing lockwashers; and 3) torquing requirements were added for the lockwasher.

Additionally, the licensee identified that the MFP governor gain control setting is set as low as possible. As a result, the MFPs are slow to respond to a speed control signal. Therefore, operator action is required to take the MFP speed control to manual and increase pump speed to provide the feedwater flow required to compensate for the loss of an MFP. The high MFP speed, coupled with the automatic shift of the feedwater regulator valves to manual, assures that ample feedwater is maintained for core cooling. However, this also requires operator action to manually trip both MFPs on a reactor trip to prevent overcooling the primary coolant system. System engineering personnel determined a modification to the MFP governor would be required to correct the slow response problem. Licensee management concluded that the gain in safety did not warrant the cost of a modification. The inspectors concluded that the actions taken were adequate; therefore, this item is closed.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Cleanliness Practices

a. Inspection Scope (62707)

The inspectors reviewed condition reports, conducted plant tours, and discussed maintenance cleanliness controls with licensee management and chemistry personnel.

b. Observations and Findings

Licensee personnel identified several examples of maintenance cleanliness and foreign material exclusion (FME) problems during the early stages of the outage. The examples included: 1) a washer, socket, and socket adaptor were dropped into the screen house basin; 2) three pieces of duct tape were found floating in the reactor side tilt pit; 3) debris was found in the reactor cavity; and 4) approximately one gallon of penetrating oil dripped into the main condenser hotwell during turbine blading inspections. A condition report was generated for each of these occurrences and, with the exception of the penetrating oil, the material was retrieved. The penetrating oil that dripped into the main condenser was "blue dotted" and therefore considered acceptable for the secondary system. The inspectors questioned licensee chemistry personnel regarding the penetrating oil's affect on secondary chemistry. Chemistry personnel calculated that the resultant sulfates would be 5.47 ppb which would exceed the normal steam generator sulfate levels of 2-3 ppb. However, no action level values would be exceeded. The assumption used in the calculation was that the contaminants were instantaneously injected into the steam generators with no prior cleanup which was conservative.

c. Conclusions

Several examples of maintenance cleanliness and FME issues were identified by licensee personnel during the early stages of the outage. Individually the identified cleanliness and FME issues were considered minor; however, collectively they indicated that additional management attention in this area was warranted.

M1.2 Observed Activities

a. Inspection Scope (62707 and 61726)

The inspectors observed all or portions of the following work activities:

Work Order No:

- 24712659 — P-10A, heater drain pump: Replace all flexible hoses
- 24811180 — CV-0847, service water supply to containment: Repair instrument air line break
- 24810163 — Right channel containment hydrogen monitoring panel EL-162: Replace hot box wiring and pressure regulators

Surveillance Activities

- M0-7A-1 — Emergency Diesel Generator 1-1 (K-6A)
- Q0-5 — Valve Test Procedure (includes containment isolation valves)
- DW0-13 — Local Leak Rate Tests (LLRT) for Inner and Outer Personnel Air Lock Door Seals
- Q0-42 — Section XI Testing of Shutdown Cooling Control Valves
- RT-71B — High Pressure Safety Injection Train 1 and 2 and Safety Injection Tank System Class 2 System Functional/Inservice Test
- FHS-M-10 — New Fuel Receipt

b. Observations and Findings

The inspectors noted that the work was performed in a professional and thorough manner. All work observed was being conducted with the work package present and in active use. Work packages were comprehensive for the task, and post-maintenance testing requirements were adequate. The inspectors frequently observed supervisors and system engineers monitoring work. When applicable, work was done with the appropriate radiation control measures in place.

c. Conclusions

Overall, the inspectors observed, during maintenance and surveillance activities, good procedure adherence, and maintenance and radiation work practices.

M1.3 1998 Refueling Outage Preparations

a. Inspection Scope (62707)

The inspectors reviewed the licensee's preparations and work scope for the upcoming 1998 refueling outage. Discussions were held with the director of maintenance and planning, outage planning supervisors, and outage planners. Planning meetings were attended. The pre-outage work scope and the work that was canceled for the outage, since the work scope was frozen, were reviewed.

b. Observations and Findings

The refueling outage started as planned on April 24, 1998, and was scheduled for 32 days. This was the licensee's shortest planned refueling outage. The last outage was scheduled for 51 days. A primary reason for the shorter refueling outage was the lack of facility changes that were scheduled for the outage. Contingency time was built into the outage schedule. There was a 12-hour window for management to perform an outage review prior to leaving cold shutdown and 16 hours for hot shutdown mode testing.

Licensee management had made several improvements in the area of outage planning and execution. One example included "scripting" the schedule. This provided a brief description of the specific action with each work order schedule item and was intended to aid departments in determining the reason an action was being performed.

The operations department was changing to two 12-hour shifts to better maintain continuity of ongoing evolutions. Outage management had discussed all outage-related operations department evolutions prior to the start of the outage. Also, the majority of tagging activities were completed well in advance of the outage.

Outage planning areas that appeared improved were the ability to merge different department outage schedules and the use of "single points of contact" for outage issues. "Single points of contact" were developed to foster better ownership of outage work items. Maintenance management had addressed a weakness identified in the last refuel outage in the area of contractor control. This was accomplished by assigning an experienced licensee maintenance manager to directly overview contractor work. The inspectors and licensee management do not view this refueling outage to be challenging based on the approximately 1,000 work orders scheduled. To reduce the workload on engineering staff and to allow more time for engineering personnel to review various options, licensee management deferred several safeguards high pressure air system upgrades to the 1999 refueling outage. These included four pressure control valve replacements and six filter relocations. Also, the licensee plans on completing the modification to replace the lubrication oil coolers on primary coolant pump P-50C only, instead of modifying all four pumps.

c. Conclusions

The planned work scope for the 1998 refueling outage should not be challenging for the licensee to safely accomplish. The level of planning and preparation was thorough and complete. However, the inspectors noted that some longstanding equipment problems were deferred.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Containment Air Lock Door Problems

a. Inspection Scope (62707 and 37551)

The inspectors reviewed recent maintenance and surveillance issues concerning the personnel air lock and to a lesser extent, the emergency escape air lock. Maintenance and surveillance procedures were reviewed. Portions of the associated surveillance test were observed. Discussions were held with maintenance and engineering personnel. Applicable TS and design bases documents were also reviewed.

b. Observations and Findings

On March 19, 1998, a maintenance crew was unable to exit containment through the personnel air lock. The handwheel on the inner door spun freely and would not open the door. The crew then attempted to exit containment through the emergency escape air lock. The technician operated the emergency door handwheel in the direction he thought was correct. However, the inner door was not opening and the technician identified, via

the door observation port, that the emergency air lock outer door had opened. The technician then tried to close the outer door but the gear mechanism which connected the hand wheel to the door had jumped out of timing and the door jammed. Another maintenance crew then entered the emergency escape lock to repair the door. The lead engineer overseeing the maintenance mentioned that the problem had occurred several times before. The gears were realigned and the doors tested satisfactorily.

Mechanical maintenance personnel later performed troubleshooting and repair activities on the personnel air lock inner door. The door failed to operate properly due to misalignment of the handwheel shaft gears and the latching mechanism gears. The apparent cause of the misalignment was a loose locking collar that allowed the handwheel shaft to move. System engineering personnel contacted the vendor to discuss the problem and were informed that this problem had occurred with other doors of a similar design. The inspectors noted that there was a periodic scheduled visual inspection of the handwheel door gear mechanism for the personnel and emergency air locks. However, fastener tightness checks were not performed. Also, the inspectors noted that the directions for operating the emergency escape air lock were hand-written on the air lock doors and not very noticeable or explicit.

On April 8, 1998, a full barrel test, which pressurizes the space between the two personnel air lock doors, was conducted. The personnel air lock failed the surveillance test. Excessive leakage was identified on the inner door and the door was declared inoperable. Operations personnel entered the appropriate TS action statement which required that the plant be placed in hot shutdown within 6 hours. Also, the outer door was locked closed as required. The licensee's TS required full personnel air lock operability. However, the licensee, based on management's interpretation of the TS, would not allow repairs to the inner door because the outer door was required to be locked closed.

Subsequently, a TS amendment was approved by the NRC and issued on April 8, 1998. The amendment incorporated a note to allow opening an operable air lock door to perform repairs on inoperable air lock components.

The personnel air lock passed the full barrel test following repairs to the inner door. However, problems were encountered following restoration of the inner door. Strongbacks were installed on the inner door as part of the test setup. Some of the strongback bolts were found to be galled while removing the strongbacks. Based on subsequent investigation by maintenance and system engineering personnel, the licensee identified that not all eight strongbacks aligned as well as others in certain locations. Maintenance and system engineering personnel reviews for corrective actions regarding the strongback issue were ongoing.

c. Conclusions

The TS amendment should benefit the licensee if personnel air lock operability problems arise in the future. However, the inspectors discussed with the licensee the need for maintenance and system engineering personnel to ensure corrective actions adequately address reliability of the personnel and emergency air locks due to the safety significance of these components regarding containment integrity as well as personnel safety.

M3 Maintenance Procedures and Documentation

a. Inspection Scope

The inspectors observed ongoing Emergency Diesel Generator maintenance activities during routine plant tours. Also, the inspectors reviewed Administrative Procedure (AP) 5.09, "Maintenance Cleanliness Standards," Revision 6, dated August 29, 1996, as well as the applicable work order package.

b. Observations and Findings

On April 26, 1998, the inspectors observed that Emergency Diesel Generator (EDG) 1-1 generator end screens were removed for maintenance and that a drop light was hanging inside the generator. However, no maintenance personnel were in the EDG room performing any maintenance activities. The inspectors questioned licensee maintenance personnel regarding FME controls for the EDG. Licensee maintenance personnel stated that leaving the generator covers off did not meet expectations but was not contrary to AP 5.09 cleanliness requirements.

Section 6.1.7 of AP 5.09 stated, in part, that after system integrity has been broken (i.e, a valve removed from a pipeline or a pump casing opened) an acceptable covering shall be used on system openings to prevent foreign matter from entering the system or equipment. Maintenance personnel stated that AP 5.09, Section 6.1.7, was for mechanical or piping systems and that it did not cover electrical systems. Maintenance personnel also stated, after further questioning by the inspectors, that FME requirements for electrical components were unclear. Subsequently, a condition report (C-PAL-98-0861) was generated by the licensee regarding unclear FME requirements for electrical components.

The inspectors noted that cleaning and inspecting the generator following the maintenance was included in the work order package. This activity was documented in the work package as being completed. Cleaning and inspecting would reduce the potential for leaving any foreign material in the generator that may have been introduced while the generator end was uncovered. Based on a review of the FME procedural requirements that were in place, it appeared that the requirements were met. However, procedure AP 5.09 was inappropriate to the circumstances in that the procedure did not have adequate specific FME requirements for safety-related electrical components, such as the emergency diesel generator. The failure to specify adequate FME requirements for safety-related components is a violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings." (VIO 50-255/98005-01).

c. Conclusions

The inspectors identified that no FME covers were installed on the EDG generator access covers and no maintenance personnel were present to maintain positive FME controls. Also, inadequate requirements existed for FME controls pertaining to electrical components which was a violation of regulatory requirements.

M8 Miscellaneous Maintenance Issues (92902)

M8.1 (Closed) Violation 50-255/97005-01: Unauthorized Code repair performed on main steam isolation valves (MSIVs), CV-0501 and CV-0510. This violation was issued due to the failure of the initial valve repairs to meet the original Code of Construction, ASA B3.1. On December 20, 1996, with the plant in hot shutdown, both MSIVs were leaking steam from the plugged stuffing box leakoff points. A pipe plug was supposed to be installed and seal welded for both valves. On CV-0501, a plug replacement was required because the temporary leak injection plug hole was leaking. However, this plug was not removed. The hole was seal welded after the hex head was ground down and the original plug was not removed. The plug on CV-0510 also was modified prior to seal welding the plug by grinding the hex head. The original plug did not get replaced as planned because it could not be removed. A lab report later indicated that the pipe plug was cast iron versus forged steel. Subsequently, the plug experienced fractures which led to the leaking.

These containment isolation valves were designed to isolate the steam generators. The leakage represented a potential release path of radiation in the event of a steam generator tube leak. Subsequently, both leaking pipe plugs were permanently repaired by installing 3000 psi, forged steel one inch pipe plugs. All work was approved and inspected by engineering staff and no new steam leaks have developed since completion of the repairs. Therefore, this item is closed. Closeout of Violation 97005-03 will address the procedural and human performance issues identified during review of this issue.

M8.2 (Closed) Violation 50-255/97005-02: Failure to submit a licensee event report (LER) in 30 days as required by 10 CFR 50.73. The licensee failed to submit an LER within 30 days after the discovering degraded stuffing boxes on the main steam isolation valves (MSIVs). Condition Report (CR) C-Pal-97-007 documented the December 20, 1996, MSIV leaks. The licensee based operability on information contained in the CR cover page. The CR did not contain any information about the potential for a piping code violation. Licensing personnel considered the steam leak to be similar to those seen during other plant startups and determined that it was not reportable.

On March 6, 1997, during the management review board to discuss this CR, management realized the issue was potentially reportable. The evaluator was requested to brief licensing personnel and make another reportability determination. The condition was subsequently determined to be reportable and LER 97-005 was initiated. The LER was submitted to the NRC on March 21, 1997.

The inspectors reviewed the corrective actions that were taken. Those actions included: 1) the licensing department was reorganized in February 1997, to place responsibility for operability determinations in one group under a regulatory response supervisor; 2) the offices of the regulatory response supervisor and licensing manager were relocated adjacent to each other in order to facilitate the flow of information; 3) the licensing department started quarterly self-assessments of the reportability process; and 4) lessons learned training on this issue was conducted at the June 1997 licensing department standdown meeting.

The corrective action process was also modified. Copies of operability redeterminations are routed to licensing. Also, the operability redetermination form was revised to provide a prompt for the shift supervisors and engineering supervisors to check if new information

affects reportability. The inspectors determined that the corrective actions were adequate; therefore, this item is closed.

M8.3 (Closed) Violation 50-255/97005-03: Failure to perform main steam isolation valve (MSIV) repairs in accordance with 10 CFR Part 50, Appendix B requirements. The seal welds on CV-0501 and CV-0510 were not performed as described in the weld inspection checklists in the work order packages. Also, the work order packages were not in use at the work site as required by Administrative Procedure 5.01, Attachment 2, "Work Order Scheduling, Performance, and Completion."

The following corrective actions were taken to prevent recurrence of this incident:

- On March 6, 1997, all three maintenance groups stopped work and held standdown meetings. The operations manager discussed expectations for job performance and the consequences of not doing maintenance work well. The lead supervisors also went over the lessons learned from the MSIV work, which included procedure adherence, roles and responsibilities, work scope control, communications, use of self-checking, and conservative decision making. Additionally, the maintenance manager issued a memorandum to all maintenance and planning department supervisors on the consequences of a weak pre-job brief.

- The licensee added an item to the maintenance department Action Plan after recognizing the need to identify multi-discipline tasks and assign a single point of contact. Also, readiness reviews and pre-job briefs were targeted for improvement. The inspectors noted that using a single point of contact in subsequent maintenance outages has been effective.

- This event and the associated lessons learned were incorporated into the continuing training program for maintenance and engineering personnel.

- The proper use of sketches within the weld inspection checklist process, particularly pertaining to seal welds, was clarified in Procedure 5.06, Attachment 1, "Preparation of Welding/Inspection Checklist."

- Licensee management appointed an experienced maintenance manager as Construction Supervisor to more effectively implement contractor control.

The inspectors determined that the corrective actions were adequate and have not identified any similar occurrences. Therefore, this item is closed.

M8.4 (Closed) Violation 50-255/97011-01: Inappropriate maintenance procedure resulted in personnel contamination. A waste gas compressor room area monitor high radiation alarm was received during maintenance on Waste Gas Compressor C-50A. The licensee subsequently identified that radioactive gases were leaking from the waste gas system header as a result of the gag that was installed on Relief Valve (RV)-1114. The method for gagging the relief valve resulted in the waste gas surge tank header and tank being open to the atmosphere, causing contamination of the maintenance crew.

A procedural weakness and failure to follow procedures were two identified root causes for this event. A fluted tap, vice a bolt as required by the procedure, was used to gag the

relief. System integrity was maintained; however, gagging the relief valve with the fluted tap allowed a pathway from the volume control tank to the compressor room due to the tap's design characteristics. Also, the procedure did not provide for breeching a radioactive gas system or have a step to identify to operations personnel and the maintenance technicians that the waste gas system would be breeched during compressor testing.

Licensee management took the following corrective actions to prevent recurrence.

- The technicians that were involved led discussions on the expectations for procedural compliance with all maintenance department personnel.
- Administrative Procedure 4.10, "Personnel Protective Tagging," had a new section added to address tagging of relief valves.
- The applicable maintenance procedure, Waste Gas System (WGS)-M-2, was revised to eliminate the need to gag RV-1114 in order to perform the component checkout test.

The inspectors reviewed the corrective actions and determined that they were adequate. Therefore, this item is closed.

III. Engineering

E1 Conduct of Engineering

E1.1 General Comments

Engineering personnel were frequently challenged with emergent equipment reliability issues. Specifically, engineering personnel had to respond to and support emergent work pertaining to containment air locks, turbine control systems, and auxiliary feedwater flow controller operational issues. Engineering personnel responded to and supported these activities in a timely manner.

E2 Engineering Support of Facilities and Equipment

a. Inspection Scope (37551, 61726 and 37551)

The inspectors reviewed the follow-up action by licensee engineering personnel regarding an NRC architect-engineering (AE) design inspection finding that pertained to inadequate inservice testing of valves, as required by TS and American Society of Mechanical Engineers (ASME), Section XI. The inspectors reviewed condition reports, attended management review boards, held discussions with system engineers, observed portions of the valve testing, and reviewed applicable TS requirements and inservice inspection piping diagrams.

b. Observations and Findings

On November 10, 1997, the licensee determined, based on an evaluation by engineering personnel of an NRC AE inspection finding, that two check valves (CK-ES3339 and

CK-ES3340) in the minimum flow recirculation piping from the discharge of each high pressure safety injection pump, were not periodically tested to confirm closure capability. Operators appropriately declared the valves inoperable. The check valves were subsequently tested satisfactorily within the time allowed by TS.

A licensee event report (LER 97-013) and supplement were issued. Licensing personnel determined that this condition was reportable as a violation of TS 6.5.7. The administrative TS referenced in the LER required that a program provide controls for inservice inspection and testing of ASME Class 1 through 3 components. The inspectors noted that system engineering personnel had a program in place. Also, five additional valves subsequently identified by system engineering personnel as lacking testing were specified in TS Table 3.6.1, "Containment Penetrations and Valves." Therefore, the five valves were reported as required.

In April 1988, procedural upgrades to EM-09-02, "Inservice Testing of Plant Valves," were completed to ensure that required valve functions identified in the Palisades Equipment Database were incorporated into the inservice testing (IST) program. Licensee system engineering personnel identified, during their review of the database, the inservice inspection piping diagram, and TS, that the following valves had inadequate test requirements:

- Check Valve CK-DMW400 had a safety function to open and allow water flow from the primary water tank to the condensate storage tank. The database incorrectly identified the open position as non-safety-related.

- Charging pump line to safety injection test line isolation valve (MO-3072) had a passive safety function to remain closed. Although the closed safety position of the valve was verified, a position indication check was required. However, the valve was removed from the surveillance testing procedure in error. This was caused by an inadequate consideration of all available information when determining the IST requirements.

- Air space purge fan (V-46) discharge isolation valves (CV-1813 and CV-1814) had a passive safety function to remain closed during any postulated accident occurring above cold shutdown. These valves are electrically locked closed per TS during power operations and therefore were capable of performing their design function.

  The valves may be opened during cold shutdown and were required to close on a containment high radiation signal. However, since containment isolation was not assumed during the postulated fuel handling accident, no credit was taken for valve closure and the active safety function to close was not included in the IST program. When the IST program was updated in 1995, licensee engineering personnel failed to add these valves for required position indication testing. This was caused by an inadequate consideration of all the available information when determining the IST scope for these valves. Prior to that update, the code did not require position indication testing for valves that have a passive function and therefore, the valves were not included in the program.

- Containment steam heating return and supply valves (CV-1501, CV-1502 and CV-1503) may be opened to provide heating to containment if needed (the heating

function has not been used in several years). The valves are required to close on a containment high pressure signal or a containment high radiation signal. In this case, the valves have an active safety function to close. However, since containment isolation was not assumed during a postulated fuel handling accident, no credit was taken for valve closure and the active safety function to close was not included in the IST program.

When the IST program was updated in 1995, licensee engineering personnel failed to test the valves for stroke time and position indication. This was caused by an inadequate consideration of all the available information when determining the IST scope for these valves.

In addition, system engineering personnel noted that the database was deficient. However, based on the effort that would be required to update and maintain the database, system engineering personnel determined it would be more effective to rely on a questioning attitude on the part of the engineers in identifying errors. Therefore, the database and component/system basis documents will only be updated as errors are identified. Potential enforcement actions pertaining to the AE findings will be addressed in Inspection Report 50-255/98004 (DRS).

c. Conclusions

The inspectors noted that the follow-up to correct identified deficiencies with inservice testing requirements was thorough. However, system engineering supervision relied on engineering personnel to identify errors in the IST program data base.

E4 Engineering Staff Knowledge and Performance

a. Inspection Scope

The inspectors observed the Management Review Board and Plant Review Committee meetings associated with the main turbine stop valve inadvertent movements and questions regarding operation of the auxiliary feedwater system flow control valve controllers. Also, the inspectors reviewed condition reports and discussed the specific issues with licensee engineering personnel.

b. Observations and Findings

Main turbine stop Valve #1 partially closed (30 percent) inadvertently from its normal full open position on March 17, 1998. A "level 2" Condition Report (C-PAL-98-0424) was generated to evaluate the acceptability of operating with the stop valve partially closed. Licensee engineering personnel consulted with vendor representatives during related investigative activities. Postulated causes were small hydraulic fluid leaks in the valve actuator, hydraulic fluid cleanliness problems, and digital electrohydraulic (DEH) control signal errors. Subsequently that same day, the turbine stop Valve #1 opened fully without any operator action. On March 17, 1998, the turbine stop Valve #1 and governor Valve #1 were closed and hydraulically isolated based on recommendations from the vendor regarding the unknown status of turbine stop Valve #1. However, the DEH control system was in the procedurally directed "auto test" mode following the closure of the valves which precluded automatic response of the turbine control system. A Management Review Board was held on March 20, 1998, to discuss turbine control

options. Licensee engineering personnel again consulted with vendor representatives. Based on these discussions, the decision was made to place the DEH controls in manual, which was accomplished without any system perturbations. This meant that only manual turbine control would be available to the operators.

The inspectors noted that licensee engineering personnel relied extensively on vendor representatives for specific turbine generator control system operational knowledge. The licensee contracted the vendor to maintain the turbine and turbine control systems and a vendor representative was retained on site. Therefore, licensee engineering reliance on the vendor representative was expected.

The licensee identified, during bench testing of new Yokagowa flow controllers for the auxiliary feedwater system, that the controller would not automatically transfer to the "cascade" mode from the "manual" mode if an auxiliary feedwater actuation signal was received. A condition report (C-PAL-98-0634) was generated. This was contrary to system engineering's understanding of how the controllers worked. In the "cascade" mode, the controller was designed to automatically set auxiliary feedwater flow to the minimum needed, 165 gpm, for decay heat removal following a plant trip regardless of what the flow controller was set at before. The controllers were to be installed during the outage as an upgrade to the auxiliary feedwater system. Two of the four auxiliary feedwater system flow controllers presently installed are Yokogowa. The licensee, therefore, intends on replacing the other two.

The inspectors questioned licensee training personnel and control room operators regarding Yokogowa controller operation. The inspectors noted that the simulator modeled the controllers correctly. The simulator modeling was changed to reflect the actual operation due to a simulator deficiency report which was generated in March 1994. Also, the operators that were questioned believed that the controllers would not automatically transfer to the "cascade" mode if they were in "manual" and an auxiliary feedwater actuation signal was received.

c. Conclusions

The licensee relied on vendor representatives rather than in-house knowledge of the turbine control systems. Also, some licensee engineering personnel did not understand the operational design for the auxiliary feedwater Yokagowa flow controllers. This indicated an apparent knowledge weakness on behalf of engineering personnel regarding auxiliary feedwater flow controllers and the turbine generator control systems.

E8 Miscellaneous Engineering Issues (92903 and 92700)

E8.1 (Closed) LER 50-255/96007-00: Inadequate Appendix R emergency lighting and ventilation in post-fire safe shutdown areas. Two areas of noncompliance with Appendix R requirements were identified by licensee system engineering personnel. The first noncompliance was identified during plant walkdowns to verify adequate emergency lighting for post-fire safe shutdown actions. The walkdown identified 12 locations where existing emergency lighting was inadequate. The second noncompliance was identified during completion of support calculations to determine if the loss of ventilation in post-fire safe shutdown areas would result in excessive temperatures during a fire related plant shutdown. The licensee determined that the control room and cable spreading room

required temporary ventilation. The use of portable fans was considered acceptable. However, current plant procedures for post-fire safe shutdown did not instruct plant personnel to use the existing portable fans for cooling the two areas.

The inspectors reviewed the following corrective actions that were taken:

- Ten existing emergency lighting units (ELUs) were re-aimed based on walkdown recommendations.
- A third headlamp was installed on seven existing ELUs, three new ELUs were installed, and one ELU was lowered, based on walkdown recommendations.
- A high pressure safety injection valve inside containment was modified to allow local manual control of the valve from outside containment instead of installing an ELU in containment, due to concerns with maintaining equipment inside containment.
- Off-Normal Procedure (ONP)-25.1, "Fire Which Threatens Safety Related Equipment," was revised to identify the need to use portable ventilation units to provide cooling to the control room and cable spreading room based on actual room temperatures.

The inspectors determined that the corrective actions taken were adequate and therefore, this item is closed.

E8.2 (Closed) IFI 50-255/96008-05: Potential for calcium carbonate fouling of service water heat exchangers. On May 31, 1996, maintenance personnel removed a section of piping downstream of the chlorination system eductor. The inner surfaces of the eductor and observable downstream piping were coated with a thick layer of calcium carbonate. Pieces of the coating, approximately three quarters of an inch in diameter, had broken off in some areas. The inspectors were concerned about the pieces potentially fouling the service water system heat exchangers.

The inspectors held discussions with the system engineer. Also, the maintenance history and the chlorination piping system were reviewed. The chlorination chemical's (sodium hypochlorite) reaction with the lake water caused the calcium carbonate to plate out on the piping walls. The eductor and a section of adjacent downstream piping were replaced. An inspection of the piping indicated the buildup of calcium carbonate was most significant nearest the eductor and tapered off further downstream in the piping. The chlorination system piping goes to the bottom of the service water bay to a section of diffuser piping with 5/16 inch perforations. Divers inspect and clean the service water bay every refueling outage. The divers also rod out the diffuser's 5/16 inch perforations to remove trapped pieces of calcium carbonate. The inspectors noted that the diffuser would trap any significant pieces of calcium carbonate, thus preventing the pieces from getting trapped in the service water system heat exchangers. Therefore, this item is closed.

IV. Plant Support

R1 Radiological Protection

R8.1 Refueling Outage and Daily Radiological Work Practices (71750 and 62707)

The inspectors observed radiological worker activities during various maintenance activities detailed in this report, and also monitored radiological practices during routine plant tours. The inspectors' observation of jobs in progress revealed that radiation technicians were visible at the job sites. Also, the technicians took appropriate actions and surveys in accordance with good ALARA practices. The inspectors concluded that radiological practices observed during the maintenance activities and routine plant walkdowns were adequate.

R8 Miscellaneous Plant Support Issues (92700 and 92904)

R8.1 (Closed) LER 50-255/97006-00: Overtime limits exceeded for radiation protection technicians. On April 12, 1997, licensee personnel identified three occasions in 1997 when the overtime limitations of Administrative Procedure 1.00 and TS 6.2.2.e.2 were exceeded. In each case, radiation protection technicians who worked both days of the weekend, worked more than 24-hours in a 48-hour period. Based on further review, the licensee identified a total of seven similar occurrences in 1996 and 1997. These occurrences were considered to represent a significant administrative breakdown of the overtime limitations policy and therefore were reportable to the NRC.

The following corrective actions were taken: 1) the scheduler for chemical and radiological services took immediate action to ensure technicians were not scheduled for more than one weekend or holiday shift in any 2 day period; 2) overtime limitation responsibilities and expectations were communicated to supervisors; 3) personnel in the human resources group started to perform 100 percent audits of overtime on a monthly basis for all non-salaried and salaried employees; and 4) overtime waivers were trended on a monthly basis and published as a performance indicator in the management performance monitoring reports. The corrective actions taken were considered adequate and therefore, this item is closed.

R8.2 (Closed) URI 50-255/97005-04: Inability to determine sensitivity of criticality monitors. The ability to safely load new fuel into the new fuel storage racks was indeterminate because a criticality monitor that met the requirements of 10 CFR 70.24, "Criticality Accident Requirements" had not been installed. Specifically, 10 CFR 70.24(a)(2) requires that the radiation monitoring system be capable of detecting a critical condition in the new fuel array which generates radiation levels of 300 rem/hour, one foot from the source of radiation. However, 10 CFR 70.24(d) states that an exemption may be requested with appropriate justification.

Licensing department personnel requested an exemption by a letter dated July 2, 1997. The Commission's technical staff reviewed the submittal and determined that the licensee met the criteria for prevention of inadvertent criticality.

The purpose of the criticality monitors required by 10 CFR 70.24(a) was to ensure that if a criticality were to occur during the handling of new fuel, personnel could be alerted to that fact and would take appropriate action. The NRC staff determined that it was extremely

unlikely that such an accident could occur. Also, radiation monitors were in place in the fuel storage and handling areas as required by General Design Criteria 63. These monitors should alert personnel to excessive radiation levels and allow them to initiate safety actions. The low probability of an inadvertent criticality, together with the licensee's adherence to General Design Criteria 63, constituted appropriate justification for the exemption to the requirements of 10 CFR 70.24(a). The licensee received the exemption on October 27, 1997. Based on receipt of this exemption, this item is closed.

S1 Conduct of Security and Safeguards Activities (71750)

During normal resident inspection activities, routine observations were conducted in the areas of security and safeguards activities using Inspection Procedure 71750. No discrepancies were noted.

F1 Control of Fire Protection Activities (71750)

During normal resident inspection activities, routine observations were conducted in the area of fire protection activities using Inspection Procedure 71750. No discrepancies were noted.

V. Management Meetings

X1 Exit Meeting

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on May 6, 1998. No proprietary information was identified by the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

R. A. Fenech, Senior Vice President, Nuclear, Fossil, and Hydro Operations
T. J. Palmisano, Site Vice President - Palisades
M. P. Banks, Manager, Chemical & Radiation Services
E. Chatfield, Manager, Training
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R. J. Gerling, Manager, Design Engineering
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G. B. Szczotka, Manager, Nuclear Performance Assessment Department
S. Y. Wawro, Director, Maintenance and Planning

NRC

R. G. Schaaf, Palisades Project Manager, NRR

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observations
IP 62707:	Maintenance Observation
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities
IP 92700:	Licensee Event Reports
IP 92901:	Follow-up Operations
IP 92902:	Follow-up Maintenance
IP 92903:	Follow-up Engineering

ITEMS OPENED AND CLOSED

Opened

50-255/98005-01	VIO	Lack of adequate specific FME requirements for electrical components.

Closed

50-255/96007-00	LER	Inadequate Appendix R emergency lighting and ventilation in post-fire safe shutdown areas
50-255/96008-05	IFI	Potential for calcium carbonate fouling of service water heat exchangers
50-255/95003-00	LER	Main feedwater pump transient resulting in a reactor trip
50-255/97005-01	VIO	Unauthorized Code repair performed on main steam isolation valves
50-255/97005-02	VIO	Failure to submit a licensee event report in 30 days as required by 10 CFR Part 50.31
50-255/97005-03	VIO	Failure to perform main steam isolation valve repairs in accordance with 10 CFR Part 50, Appendix B requirement
50-255/97006-00	LER	Overtime limits exceeded for radiation protection technicians
50-255/97011-01	VIO	Inappropriate maintenance procedure results in personnel contamination
50-255/97005-04	URI	Inability to determine sensitivity of criticality monitors.

LIST OF ACRONYMS USED

AE	Architect Engineer
ALARA	As Low As Reasonably Achievable
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
CK	Check Valve
CR	Condition Report
DEH	Digital Electrohydraulic
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
EDG	Emergency Diesel Generator
DWO	Daily/Weekly Operations
EHC	Electrohydraulic Control
ELU	Emergency Lighting Unit
FHS-M	Fuel Handling System-Maintenance
FME	Foreign Material Exclusion
HPSI	High Pressure Safety Injection
IFI	Inspection Follow-up Item
IST	Inservice Test
LER	Licensee Event Report
MFP	Main Feedwater Pump
MO	Monthly Operations
MSIV	Main Steam Isolation Valve
NRC	Nuclear Regulatory Commission
ONP	Off Normal Procedure
PDR	Public Document Room
QO	Quarterly Operations
RT	Refueling Test
RV	Relief Valve
TS	Technical Specifications
URI	Unresolved Item
VIO	Violation
WGS	Waste Gas System