U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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License No:	DPR-20
Report No:	50-255/98022(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:	November 26, 1998, through January 12, 1999
Inspectors:	J. Lennartz, Senior Resident Inspector B. Fuller, Resident Inspector - D.C. Cook M. Holmberg, Reactor Engineer, RIII
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EXECUTIVE SUMMARY

Palisades Nuclear Generating Plant
NRC Inspection Report 50-255/98022

This inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a 7-week period of resident inspection activities.

Operations

- An oil leak on Primary Coolant Pump P-50D resulted in a forced outage. In addition, several emergent equipment problems challenged plant operations during the forced outage. The equipment problems included pressurizer power operated relief valve position indication unreliability, main steam line isolation valves failure to fully close, and control rod drive #2 housing leakage. The emergent issues were addressed in a deliberate manner and the plant was manipulated in a conservative manner with a positive focus on safety. (Section O1.1)

- An operator work around was created by the inoperable pressurizer power operated relief valve position indication lights. The work around had minimal impact on the operators and the appropriate contingency actions were established. (Section O1.2)

- The action taken by the licensee to place the plant in cold shutdown within 24 hours in response to the identified leakage from control rod drive #2 was conservative when considering Technical Specifications and demonstrated a positive focus on safety. (Section O1.3)

- The licensee effectively promulgated new commitments regarding primary coolant system leakage by revising procedures and control room data sheets. (Section O3.1)

- Control room operator response to a loss of a safeguards transformer event was effective. A positive questioning attitude and a pro-active initiative were demonstrated by the operating crew and outage management regarding briefing the potential for a loss of off-site electrical power because of ongoing activities for the plant conditions that existed. This was considered as a positive attribute regarding operator performance and contributed to the crew's exemplary performance while responding to a loss of the safeguards transformer. (Section O4.2)

- A number of operator errors and operational problems occurred due to a lack of consistent comprehensive pre-evolution briefings, and a lack of rigor regarding attention to detail by the operators while performing assigned duties. Operator performance deficiencies contributed to the cooling tower basin being overfilled twice, two instances where primary coolant system pressure exceeded procedural limits, and not recognizing Technical Specification requirements when the main steam isolation valves did not go fully closed. In addition, an operator's failure to conduct self-checking activities while manipulating equipment was a concern in that it directly resulted in placing a safety-related system in a configuration that was contrary to procedural requirements which was a Non-Cited Violation. (Section O4.5)

Maintenance

- Outage planning and scheduling personnel addressed the emergent issues in a deliberate manner which demonstrated a positive focus on safety. Also, a positive focus on safety was demonstrated by having a shift outage manager stationed 24 hours from the time the forced outage commenced until the plant was returned to full power. (Section M1.1)

- The licensee missed an opportunity to identify the leak at the reactor coolant pump P-50A cover to casing joint during the June 1998, system pressure test, which indicated a lack of rigor in the conduct of this testing. Further, the licensee had failed to submit a structural evaluation on the degraded pump joint to the NRC which was a violation of regulatory requirements and demonstrated a poor understanding of the applicable Code requirements. (Section M1.2)

Engineering

- Engineering personnel conducted thorough testing and performed an in-depth analysis regarding the failure of the main steam isolation valves to close which was determined to be a maintenance preventable functional failure. Inoperability of the main steam isolation valves from May 29, 1998, until the condition was corrected on December 19, 1998, was a Non-Cited Violation. (Section E2)

- Engineering personnel conducted extensive testing on the pressurizer power operated relief valves and provided a thorough operability recommendation to operations. However, an operator work around was created in that the position indication lights remained inoperable pending required repairs prior to plant start-up following the next time the plant is in cold shutdown. (Section E2)

- System engineering personnel demonstrated a positive questioning attitude during the outage that contributed to identifying that the primary coolant pumps' oil collection system did not meet regulatory requirements. However, engineering personnel missed an earlier opportunity to identify the deficiency during an engineering analysis that was conducted in the early 1990's. The inadequate primary coolant pumps' oil collection system was a Non-Cited Violation. (Section E4)

Plant Support

- Effective dose management was demonstrated during the outage. Also, flush of the shutdown cooling heat exchangers, a first time evolution, demonstrated a positive pro-active initiative to reduce radiation dose rates in plant areas that were routinely toured by plant personnel, the safeguards rooms. (Section R1.1)

Report Details

Unless otherwise stated, "Code" as discussed herein, refers to the 1989 Edition no Addenda of Section XI, of the American Society of Mechanical Engineers (ASME) Code.

Summary of Plant Status

The plant was at full power at the beginning of the inspection period. On December 13, 1998, the plant was placed in hot standby to investigate a lowering level in the upper oil reservoir on Primary Coolant Pump P-50D. An oil leak was confirmed and the plant was subsequently placed in cold shutdown on December 15, 1998. The forced outage was scheduled for 6.5 days to complete the primary coolant pump repairs as well as to replace the seals on Control Rod Drive #36 that had elevated leakage. The plant was returned to hot shutdown on December 26, 1998; however, a leak on Control Rod Drive #2 seal housing was identified and the plant was again placed in cold shutdown to conduct repairs. The Control Rod Drive #2 seal housing leak as well as several other emergent equipment problems extended the forced outage to a total of 25 days. The reactor was subsequently taken critical on January 7, 1999, and the plant was synchronized to the grid on January 8, 1999. Power escalation to full power was completed on January 10, 1999, where the plant remained during the inspection period.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

Forced Outage 985004 was commenced on December 13, 1998, due to the oil leak on Primary Coolant Pump P-50D and was scheduled for 6.5 days. Control Rod Drive #36 seals were also scheduled to be replaced due to elevated leakage. The following equipment problems emerged during the outage which challenged plant operations.

- Main steam isolation valves (MSIVs) failed to close fully during the plant shutdown.
- Position indication lights on the pressurizer power operated relief valves (PORVs) appeared unreliable and extensive testing was conducted.
- A casing leak on Primary Coolant Pump P-50A caused degradation of two bolts on the pump casing.
- Safeguards transformer load tap changer failed that resulted in a momentary loss of the safety-related electrical busses.
- A leak was identified on Control Rod Drive Mechanism #2 seal housing and the plant had to be placed in cold shutdown a second time to conduct the repairs.

- Elevated leakage from Primary Coolant Pump P-50A pump seals was observed during plant heat-up and the seals were subsequently replaced.

In response to these emergent issues, the plant was manipulated in a conservative manner with a focus on safety as evidenced by: 1) safeguards transformer repair activities in the switchyard were delayed until the plant was placed in a more stable condition regarding pressure control; and 2) operations management self-imposed a time limit of 24 hours to reach cold shutdown following identification of suspected primary coolant pressure boundary leakage on Control Rod Drive #2 seal housing. Also, plant management addressed all of the emergent issues in a deliberate manner and consulted with safety assessment personnel to utilize risk assessment information in their decisions when appropriate. For example, risk assessment information regarding the systems that would be available for core cooling during a postulated loss of all electrical power was utilized in the decision to conduct troubleshooting on the safeguards transformer while in hot shutdown vice cold shutdown.

A positive focus on safety was also demonstrated by having reactor engineering personnel onsite continuously during the plant startup and subsequent power escalation to full power. Reactor engineering personnel periodically performed surveillances to monitor reactor core parameters and immediately provided the operators information regarding any power limits.

The inspectors concluded that, during the forced outage, all of the emergent issues were addressed in a deliberate manner and that the plant was manipulated in a conservative manner with a positive focus on safety.

O1.2 Pressurizer PORV Inoperable Position Indication

a. Inspection Scope (71707)

During the December 1998 forced outage, the licensee experienced problems with the reliability of the PORV position indication lights. The technical resolution of this issue is discussed in Section E2.2 of this report.

The inspectors reviewed the applicable Technical Specifications (TSs), the Updated Safety Analysis Report, established contingency actions, and discussed the issue with operations management.

b. Observations and Findings

Technical Specification 3.17.6 required a minimum of one operable channel of position indication per PORV. The inspectors verified that the temperature monitoring in the tale pipe and the acoustic monitoring system were both operable for each PORV. Therefore, the requirements of TSs were met. However, the inoperable position indication lights in the control room created an operator work around.

The PORV block valves are normally closed to isolate the PORVs during operations at power because credit was not taken for operation of the PORVs in the plant transient accident safety analysis. Therefore, inoperable PORV position indication, while at power, had minimal impact on the operators.

The PORVs were designed to protect the primary coolant system from overpressure during abnormal transients associated with low temperature (less than 430°F), water solid system operations. The PORVs were also required to function for a "feed and bleed" evolution as a contingency action to cool the primary coolant system during an emergency shutdown if needed. Alternate position indication was available to the operators if the PORVs had to be utilized for these functions.

The following contingency actions were established: 1) caution tags were hung on the PORV handswitches in the control room to remind the operators that the position indication lights were unreliable; 2) each crew was briefed regarding this condition and the need to use alternate indications to determine PORV position if needed; and 3) operator's continuing training would reinforce the use of alternate indications. The inspectors considered the contingency actions as appropriate.

c. Conclusions

The inspectors concluded that the operator work around created by the inoperable pressurize PORV position indication lights had minimal impact and that appropriate contingency actions were established.

O1.3 Control Rod Drive Mechanism #2 Seal Housing Leakage

a. Inspection Scope (71707, 37551)

The inspectors reviewed applicable condition reports and the associated operability recommendations. Also, the inspectors reviewed the event notification worksheet.

b. Observations and Findings

On December 26, 1998, with the plant in hot shutdown, system engineering personnel identified minor leakage in the autoclave area of Control Rod Drive #2 during a primary coolant system pressure test. The boric acid residue was cleaned from the area in an attempt to identify the source of the leak. The area was observed to be wet on a subsequent walkdown and the autoclave studs were re-torqued with no apparent affect on the indicated leakage.

The source of the leak could not be definitively determined while in hot shutdown and the leakage was very minor; however, a build-up of boric acid indicated that the leak had been active for some time. System engineering personnel suspected that it was primary coolant system pressure boundary leakage. Consequently, the control rod drive mechanism housing had to be removed to positively determine the source of the leak. Therefore, the plant was returned to cold shutdown on December 28, 1998, to conduct the repairs. This condition was appropriately reported to NRC in accordance with 10 CFR 50.72. Investigations while in cold shutdown revealed that the leak was from the control rod drive seal housing which was subsequently replaced.

The inspectors noted that operations personnel imposed a time limit of 24 hours to reach cold shutdown for the leak. Technical Specification 3.1.5, "Primary Coolant System Leakage Limits," required the plant to be in cold shutdown in 24 hours if identified primary coolant system leakage exceeded 10 gpm or if unidentified primary coolant system leakage exceeded 1 gpm. The leakage from Control Rod Drive #2 was much less than 1 gpm and TSs did not address pressure boundary leakage. Therefore, the action that was taken to place the plant in cold shutdown in 24 hours was conservative when considering TSs and demonstrated a positive focus on safety.

c, Conclusions

The inspectors concluded that the action taken to place the plant in cold shutdown within 24 hours in response to the identified leakage from Control Rod Drive #2 was conservative when considering TSs and demonstrated a positive focus on safety.

O3 Operations Procedures and Documentation

O3.1 Primary Coolant System Leakage Monitoring Commitment (71707)

The inspectors reviewed the revisions that were made to General Operating Procedure (GOP) -13, "Primary Coolant System Leakage Calculation," Revision 12, to address a licensee commitment (see Section M1.2 of this report for details) regarding primary coolant system leakage. The inspectors noted that the procedure was revised to provide the three action levels discussed in the relief request including: 1) 0.2 gpm rise in containment sump level; 2) 0.3 gpm calculated total unidentified primary coolant system leakage; and 3) 0.5 gpm calculated total unidentified primary coolant system leakage. The action steps associated with the various action levels provided adequate procedural guidance to address the commitment requirements.

Also, the inspectors noted that the control room data sheet (hourly) was revised in that a note was added that highlighted the commitment regarding containment sump monitoring. The inspectors concluded that the revisions to GOP-13 and the control room data sheet (hourly) provided adequate procedural guidance to address the licensee's commitment regarding primary coolant system leakage.

O4 Operator Knowledge and Performance

a. Inspection Scope (71707)

The inspectors observed the control room operators response to the loss of the safeguards transformer as well as portions of the plant shutdown and subsequent plant startup activities. In addition, the inspectors reviewed applicable condition reports, TSs, and questioned operators regarding various evolutions.

b. Observations and Findings

O4.1 General Comments

In general, operator performance during the forced outage was characterized by the effective control of plant activities. The operators were challenged by the equipment reliability problems that required entries into cold shutdown on two separate occasions. Procedure adherence and self checking were effectively demonstrated during the plant startup and plant shutdown activities. Reactivity manipulations were performed in a deliberate and controlled manner with appropriate oversight from the control room supervisor.

O4.2 Operator Response to Safeguards Transformer Failure

A positive attribute regarding operator performance was identified this inspection period during the loss of the safeguards transformer event. The safeguards transformer normally supplies power to the safety-related electrical busses. The voltage control system on the safeguards transformer failed in that contacts were sticking on the motor that moved the tap changer to automatically adjust transformer voltage. The sticking contacts caused the tap changer motor to decrease transformer output voltage to the minimum setting and therefore reduced voltage on the safety-related busses. Consequently, the supply breakers to the safety-related busses from the transformer opened on undervoltage that resulted in a momentary loss of both safety-related electrical busses. Both emergency diesel generators started and their output breakers closed to supply power to the safety-related busses. Subsequently, all safety-related components were started by the shutdown sequencer and were powered by the emergency diesel generators. All plant systems operated as designed following the event.

During the event, the primary coolant system was in a "solid" condition which challenged the operators response because slight changes in system temperature and flow could result in significant changes in system pressure. The operators responded to and mitigated the event in an effective manner. Primary coolant system pressure was effectively controlled to preclude exceeding any pressure limits associated with primary coolant pump operations and any low temperature overpressure protection system limits. Crew communications and senior reactor operator command and control were effective. In addition, the crew correctly diagnosed the event in a timely manner.

Shift outage management reminded the crews' shift supervisor, prior to start of the shift, of the ongoing electrical system activities in the switchyard and that these activities increased the potential for a loss of off-site electrical power. Based on that reminder, the shift supervisor directed the crew to review the procedures and also held discussions regarding contingency actions for a loss of off-site power. Consequently, the crew was prepared to respond and effectively mitigated the transient with various plant systems in off-normal configurations. This demonstrated a positive questioning attitude and a pro-active initiative by the operating crew and outage management that contributed to the crews effectiveness in responding to the event.

O4.3 Operator Error Because of Failure To Perform Self-Check

Standard Operating Procedure - 16, "Component Cooling Water System," General Requirement 7.3.1.b, required two component cooling water (CCW) heat exchangers in service anytime two CCW pumps are running. On December 22, 1998, while securing shutdown cooling and with two CCW pumps running, an operator isolated CCW to the "B" CCW heat exchanger instead of securing CCW to the shutdown cooling heat exchanger. Consequently, the CCW system was placed in a configuration that was contrary to procedure requirements. The adverse condition existed for approximately 10 minutes. The operators' failure to perform self checking during the evolution contributed to the incident. Condition Report C-PAL-98-1986 was generated to document this incident.

The procedure limitations preclude heat exchanger tube wear because of excessive system flow rates through a single heat exchanger from two operating CCW pumps. Engineering analysis EA-GAK-98-003 concluded that tube wear would not occur due to high flows during short term (less than 24 hours) operation. Therefore, this incident did not result in adverse safety consequences. Also, there was no evidence of heat exchanger degradation based on observed system parameters.

The operators failure to conduct self checking was a concern in that it directly resulted in placing a safety-related system in a configuration that was contrary to procedure requirements. The inspectors determined, based on discussions with the operations manager, that failure to perform self checking did not meet management expectations. Corrective actions included counseling and ongoing coaching of the individual operator and all of the operating crews were briefed by operations management regarding this incident. Self-checking expectations as well as expectations regarding prioritizing and controlling activities in the control room were emphasized during the briefings.

Securing one CCW heat exchanger when two CCW pumps were operating placed the CCW system in a configuration that was contrary to procedure requirements and is a Violation of 10 CFR Part 50, Appendix B, Criterion V, procedures. This non-repetitive, licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (50-255/98022-01(DRP)).

O4.4 Failure to Follow Surveillance Procedure

Technical Specification Surveillance Procedure RI-47, "Rod Withdrawal Prohibit Interlock Matrix Check," was being performed in preparation for plant startup on December 27, 1998. Procedure RI-47, Step 5.5.1, required that operations bypass reactor protection channel "A" variable high power and thermal margin low pressure trips. Also, the procedure required that the instrument and control technician independently verify completion of the step. The procedure required signatures, upon step completion, from the individuals who performed and verified the step. The inspectors noted that both the "performed by" and the "verified by" blocks contained signatures.

However, during performance of RI-47, Step 5.7.7, removal of bypasses installed during Step 5.5.1, a second operator identified that the bypass key had not been installed for the thermal margin low pressure trip. Consequently, the appropriate trips were not bypassed as required by the procedure. A level 2 Condition Report (C-PAL-98-1997) was generated to document this incident. A root cause evaluation was required for the condition report.

The licensee's root cause evaluation for the incident was in progress and had not been completed. Therefore, this item is being opened pending further review of the licensee's root cause investigation and corrective actions (EEI 50-255/98022-02). The apparent failure to follow procedures and apparent failure to conduct an independent verification was a concern.

O4.5 Operator Performance Deficiencies

Several operator performance deficiencies occurred during the outage that detracted from the overall positive performance that was demonstrated during the plant shutdown and the subsequent startup. The performance deficiencies included:

- The cooling tower basin overflowed twice during the outage while performing evolutions to change cooling tower system flow paths. Procedure weaknesses, as well as an inadequate pre-evolution brief, contributed to the first incident. The second overflow resulted because the level instrument that provided indication in the control room was inoperable because it was frozen and the level was not monitored long enough locally to preclude the incident. Non-conservative decision making by shift management contributed to the second incident. Consequently, water flooded two buildings (3 to 6 inches of standing water on floor), and the surrounding area, that were utilized for storage of radioactive waste during both incidents. Condition Reports C-PAL-98-1943 and C-PAL-98-1957 were generated to document the incidents. Subsequent evaluations regarding the radiological aspects of the incidents determined that there was no release of radioactivity outside of the protected area and, therefore, no threat to public health and safety.

- The control room operators failed to recognize applicable TS requirements following the failure of the MSIVs to fully close (see Section E2.1 of this report for details). Technical Specification 3.5.1.f required the MSIVs to be capable of closing in 5 seconds or less under no-flow conditions. The MSIVs did close, based on control room indication, within 5 seconds when the operators closed them during the plant shutdown on December 14, 1998; therefore, the operators considered the valves operable. However, they did not go fully closed as was discovered on December 15, 1998, by local valve position verification. A cooldown to place the plant in cold shutdown was in progress when the MSIVs were discovered partially open.

  After the MSIVs were discovered partially open the operators referenced TS 3.5.1.f but failed to recognize that the MSIVs were not operable in that they did not go fully closed. Consequently, TS 3.5.3, required the plant to be placed in cold shutdown within 24 hours. Technical Specification 3.5.3 requirements were fortuitously met in that the plant was placed in a cold shutdown condition within the required time limit.

- Operators demonstrated difficulties in controlling primary coolant system pressure during solid plant operations on two separate instances. In one instance, primary coolant system pressure momentarily exceeded a procedural limit. Standard Operating Procedure-3, "Safety Injection and Shutdown Cooling System," Step 5.1.3, required that primary coolant system not exceed 270 psia with the shutdown cooling system in service. Primary coolant system pressure momentarily (less than a minute) reached 274 psia while securing shutdown cooling on December 21, 1998, before the operators terminated the pressure rise.

  In the second incident, primary coolant system pressure momentarily (1.5 minutes) decreased below the procedure limit for primary coolant pump operations. This incident occurred when the operators were securing one of the two operating charging pumps on December 16, 1998. The procedure limit was based on sustained primary coolant pump operations and therefore decreasing below the limit for 1.5 minutes had no adverse safety consequences. Also, pressure was immediately restored. Condition Reports C-PAL-98-1985 and 98-1955 were generated for the incidents.

  The inspectors considered both incidents as minor in that no adverse safety consequences resulted. However, in discussions with the operators involved, the inspectors noted that there was an apparent knowledge weakness regarding system response when securing shutdown cooling while the primary coolant system was solid. Also, in one instance, the pre-evolution brief did not address contingency actions if the expected response was not observed. Consequently, the control room supervisor did not identify specific contingency actions to mitigate the unexpected response. In addition, the inspectors noted that "just in time" training (training prior to performance of the evolution) was not conducted for solid plant operations during the forced outage. Training on solid plant operations was normally conducted for scheduled outages but not for forced outages. The lack of "just in time" training on solid plant operations during the forced outage contributed to the performance deficiencies.

- An auxiliary operator identified an inoperable nitrogen station on December 24, 1998, when the plant was in a condition that required the nitrogen station to be operable. Condition Report 98-1993 was generated for this instance. The inspectors considered this incident as minor in that no adverse safety consequences occurred and, fortuitously, the nitrogen station was returned to an operable status prior to exceeding any administrative (standing orders) TS limits. However, the incident demonstrated a lack of rigor regarding attention to detail by the auxiliary operators in that operator checklists that were applicable when shutdown cooling was in service were being utilized after shutdown cooling was secured. Also, none of the operations checklists verified that the nitrogen station was operable prior to going above 300°F.

- On January 4, 1999, control room operators attempted to start Primary Coolant Pump P-50B for post maintenance testing and the pump failed to start. Subsequent investigation revealed that the pump's supply breaker was not racked in properly. Condition Report C-PAL-98-0015 was initiated. The pump was started successfully after the breaker was racked in properly. The operators failure to rack in the breaker properly demonstrated a lack of rigor regarding attention to detail during performance of assigned duties.

The operator performance deficiencies described above were individually considered of minor safety consequence. However, collectively they indicated that continued management attention regarding operations procedure adherence and the rigor applied regarding attention to detail by the operators while performing assigned duties was warranted. At the exit meeting for this inspection, the licensee management staff stated that they recognized these concerns and that action will be taken to assess and address the causes for the inconsistent performance by operations staffs.

c. Conclusions Regarding Operator Performance

The inspectors concluded that, in general, operator performance during the forced outage was effective overall. A positive questioning attitude and a pro-active initiative were demonstrated by the operating crew and outage management regarding the potential consequences for a loss of off-site electrical power because of ongoing activities for the plant conditions that existed. This was considered as a positive attribute regarding operator performance and contributed to the crew's effectiveness in responding to a loss of the safeguards transformer event.

The inspectors also concluded that continued management attention regarding the rigor applied regarding attention to detail by the operators while performing assigned duties was warranted. This was evidenced by the occurrence of a number of operator performance deficiencies during the outage. An operators' failure to effectively conduct self-checking activities while manipulating equipment was a concern in that it directly resulted in placing a safety-related system in a configuration that was contrary to procedural requirements which was considered a Non-Cited Violation.

O8 Miscellaneous Operations Issues

O8.1 (Closed Licensee Event Report (LER) 50-255/98-007: High Pressure Safety Injection System Inoperability. This event was discussed in detail in Inspection Report 50-255/98007. A violation (EA 98-433) was subsequently issued in a letter from the NRC to the licensee dated December 11, 1998. No new issues were revealed by this LER. This item is closed.

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments (61726 and 62707)

Portions of the following maintenance work orders and surveillance activities were observed or reviewed by the inspectors:

Work Order No:

- 24814631, Primary Coolant Pump P-50D Oil Leaks
- 24814836, Power Operated Relief Valves
- 24814837, Power Operated Relief Valves
- 24814680, MSIV CV-0510
- 24813733, MSIV CV-0501

Surveillance No:

- Q0-1, "Safety Injection System"
- DWT-12, "Monitoring Reactor Parameters"
- RO-22, "Control Rod Drop Times"
- RIA-115, "Power Operated Relief Valves"
- QO-37, "Main Steam Isolation and Bypass Valve Testing"

Several emergent equipment problems challenged the maintenance organization. Maintenance was effectively completed in a timely manner. Outage planning and scheduling personnel addressed the emergent issues in a deliberate manner which demonstrated a positive focus on safety. Also, a positive focus on safety was demonstrated by having a shift outage manager stationed 24 hours from the time the forced outage commenced until the plant was returned to full power. The shift outage manager provided timely support for emergent issues which reduced the burden on the control room shift supervisor.

The work packages reviewed were well documented. Scheduled activities for the forced outage effectively repaired known equipment problems that had the potential to challenge plant operations (i.e., control rod drive #36 seals; boric acid heat tracing on the gravity feed lines to the safety injection and refueling water storage tank). Based on inspector observations, maintenance activities were planned and performed effectively in accordance with procedural guidance.

M1.2 Missed Opportunity to Identify Primary Coolant Pump P-50A Leakage

a. Inspection Scope (73753)

The inspectors reviewed licensee activities related to the identified leakage from Primary Coolant Pump P-50A.

The inspectors reviewed the following documents: letter from N. Haskell to the NRC "Inservice Inspection Program-Submittal of Relief Request No. RR-13 For NRC Approval," dated December 20, 1998, EA-C-PAL-98-1067-01 "P-50A Case to Cover Stud Evaluation," dated May 23, 1998, EA-C-PAL-98-1939-01 "Evaluation of Corrosion on Studs Between Casing and Cover of Pump P-50A," dated December 19, 1998.

b. Observations and Findings

During an NRC inspection conducted in May, 1998, an NRC inspector observed corrosion and wastage of a 2-inch component cooling water supply line flange to the Reactor Coolant Pump P-50A (IR 50-255/98006). At that time, the licensee believed that this condition and the nearby corrosion of two 4.5 inch nominal diameter ASME Code Class 1 (Category B-G-1) pump case to cover bolts was caused by the leakage from the mechanical shaft seal on the pump. The 16 pump case to cover studs in each of the four reactor coolant pumps were inspected and only the two studs in the P-50A pump had significant wastage. The diameter of these studs had been reduced to 3.97 inches and 3.92 inches. The licensee performed an analysis, EA-C-PAL-98-1067-01, "P-50A Case to Cover Stud Evaluation," to accept the affected pump casing joint for continued service.

However, the licensee failed to follow the requirements in Article IWB-3134(b) of Section XI of the ASME Code which required the analytical evaluation (pursuant to Article IWB-3142.4 requirements) used to accept the pump bolts for continued service, to be submitted to the regulatory authority having jurisdiction at the plant site. As of December 18, 1998, the licensee failed to submit the analysis EA-C-PAL-98-1067-01 to the NRC as required by Article IWB-3134(b) which is a violation of 10 CFR 50.55a(g)(4) (50-255/98022-03(DRP)). The failure to submit this analysis to the NRC demonstrated poor understanding of the applicable Code requirements.

On December 15, 1998, during a forced outage, the licensee identified a fine spray of water from the P-50A pump cover to casing joint impinging on the previously identified degraded studs. The licensee identified that the degraded studs had been further reduced in cross section to 3.77 inches and 3.81 inches by the ongoing leakage and boric acid attack. This leakage had not been previously identified during the system pressure test and the Code VT-2 inspection performed in June 1998 during the outage. The failure to identify this leakage during the June system pressure test, indicated a lack of rigor in the conduct of the system pressure testing. The licensee performed an additional structural analysis EA-C-PAL-98-1939-01 "Evaluation of Corrosion on Studs Between Casing and Cover of Pump P-50A" to accept the degraded studs for continued service. Following discussions with NRC inspectors, the licensee subsequently submitted this evaluation to the NRC on December 20, 1998, to comply with Article IWB-3134(b) requirements.

Article IWA-5250 of Section XI of the ASME Code required disassembly of the leaking joint to inspect and evaluate the bolting. However, the licensee considered the disassembly of this pump casing joint to impose a hardship caused by the required plant conditions to perform the work (reduced inventory configuration) which impacted the forced outage schedule and increased outage radiation dose. On December 18, 1998, the licensee discussed their plans to return to power operation with degraded pump bolts on Pump P-50A, with the Office of Nuclear Reactor Regulation. On December 20, 1998, the licensee submitted a Code Relief Request No. RR-13 which requested deferral of the repair to the leaking P-50A pump joint until the 1999 refueling outage based on a structural evaluation, compensatory actions in place, and the dose consequence to immediately comply with Code requirements. The relief request was granted on December 21, 1998, following review by NRC technical experts.

The licensee, as documented in Relief Request No. RR-13, established seven new commitments that will be in effect until the end of the 1999 refueling outage. The commitments included:

- A visual inspection of the pump flange area will be conducted for each forced shutdown prior to the 1999 refueling outage which required the plant to be in hot shutdown or below.
- Ultrasonic testing inspections of the degraded studs will be performed for each forced shutdown requiring the plant to be in cold shutdown.
- The degraded bolting will be replaced: 1) when data indicates degradation will exceed the limits established by analysis; and 2) no later than the next refueling outage scheduled to begin in October 1999.
- Primary coolant system leakage will be administratively limited to 0.5 gpm versus the 1.0 gpm that was allowed by TS 3.1.5.a.
- With the plant at steady state power operations, if a primary coolant system leak rate calculation indicated an unidentified leak rate in excess of 0.3 gpm, or the containment sump level trend indicated by the Plant Process Computer indicated a change in unidentified sump in-leakage rate in excess of 0.2 gpm, then a confirmatory leak rate calculation will be performed as soon as possible.
- The licensee's actions to implement these new commitments are discussed in Section 03.1 of this report.

c. Conclusions

The licensee had missed an opportunity to identify the leak at the Reactor Coolant Pump P-50A cover to casing joint during the June 1998 system pressure test which indicated a lack of rigor in the conduct of this testing. Further, the licensee had failed to submit a structural evaluation on the degraded pump joint to the NRC which was a violation of 10 CFR 50.55a(g)(4) and demonstrated a poor understanding of the applicable Code requirements.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Failure of MSIVs To Fully Close During Plant Shutdown

a. Inspection Scope (37551, 71707, 61726)

The inspectors reviewed licensee actions in response to the failure of the MSIV's to fully close and applicable control room logs, condition reports, surveillance procedures, and TSs. Also, the inspectors observed portions of the troubleshooting activities and the plant review committee meetings, and reviewed the root cause analysis.

b. Observations and Findings

The MSIVs (CV-0501 and CV-0510) were closed on December 14, 1998, at 2:00 p.m. for the plant shutdown. Closed indication was received in the control room and, based on that indication, the control room operators concluded that the MSIVs were closed. Local verification was neither required nor conducted at that time.

On December 15, 1998, at 1:30 a.m., with the MSIV bypass valves and the MISVs all indicating closed, the control room operators identified that secondary steam pressures remained approximately equal to steam generator pressures. The MSIV bypass valves were cycled opened and closed with no apparent change in the system parameters. At that time, the operators suspected that the MSIVs were not fully closed which was confirmed by local valve position indication verification. Both MISVs were partially open (CV-0501 was approximately 7/8 inches from the fully closed position and CV-0510 was approximately 5/8 inches from the fully closed position). The MSIVs subsequently went full closed later that day, with no operator action, when steam generator pressures were less than 600 psia. Condition Report C-PAL-98-1942 was generated to document the deficiency.

The MSIVs were swing check valves that would "fall" into the process steam flow when the air used to open the valves was vented off below the actuator piston. The combination of the weight of the valve disc, spring pressure above the actuator piston, and process steam flow would close the valves.

System engineering personnel conducted rigorous testing of the MISVs with the plant in cold shutdown and also consulted with the vendor. During the testing, the valves were instrumented to show actuator cylinder air pressures and valve position in degrees of rotation. The actuator cylinder air pressure indicated that a relatively low cylinder air pressure was reached before the valves started to close and that a relatively high cylinder air pressure was needed to get the valves to start to open. Based on these results, system engineering personnel determined that the valves were sticking and, as a corrective action, they reduced the torque on the valve stem packing glands.

Subsequently, system engineering personnel concluded that a slight vacuum was being developed on the spring side (atmospheric side) of the actuator cylinder during the closing cycle when using both vent paths simultaneously. Two independent vent paths were available for each MSIV via redundant solenoids. System engineering personnel determined that the vent on the spring side of the actuator was not large enough to allow air to enter the actuator as fast as air was being vented from the piston side. An Engineering Analysis (EAR-98-750) was completed prior to increasing the actuator atmospheric vent size. Specifically the existing vent plug that had a 1/4 inch drilled hole in it was removed which effectively increased the actuator vent size to 3/4 inches. Further investigation revealed that the 1/4 inch vent plug was installed for debris control during factory testing following actuator refurbishment in the 1980's and was not intended to remain installed.

The inspectors questioned engineering personnel regarding past performance of the MSIVs. System engineering personnel indicated that the valve stem packing method and material was changed during the 1998 refueling outage in an effort to reduce valve stem packing leaks. The new method consolidated the packing during installation in that each packing ring was torqued individually vice applying the torque only once to the entire packing gland after all of the packing was installed. Specifically, the new method applied 40 foot pounds of torque to each of the inner packing rings after they were installed and then 58 foot pounds of torque was applied after the outer packing ring was installed. The new packing method was successful in reducing the valve stem leakage; however, the increased friction on the packing apparently contributed to the valves failure to close.

On May 20, 1998, following repacking using the new method and material, the MSIVs were stroked satisfactorily and, therefore, met the requirements of TSs. However, due to leakage, the torque on one of the packing glands for MSIV CV-0501 was increased to 100 foot pounds on June 10, 1998, with the plant in hot shutdown following the 1998 refueling outage. Valve CV-0501 was subsequently stroked satisfactorily, based on control room indication, in accordance with special test T-377, "Main Steam Isolation Valve Hot Shutdown Packing Adjustment Stroke Time Test." However, local valve position verification was neither required nor performed. Consequently, it could not be definitively concluded that CV-0510 went full closed.

Both MSIVs failed to fully close during this outage but only CV-0501 had packing adjustments performed following the 1998 refueling outage. Therefore, the packing adjustment apparently was not the only cause of the subsequent failures. Also, system engineering personnel discussions with the vendor revealed that changes in the packing characteristics during the power run were unlikely; however, changes in MSIV dimensional configuration and/or packing loading could not be ruled out.

The inspectors considered the analysis that was performed by system engineering personnel as rigorous. However, system engineering personnel did not determine the exact failure mechanism. They concluded that the most likely cause for the failure was that the 58 foot pounds that was applied to the outer packing ring eventually equalized the consolidation on all of the packing rings during the extended power run that increased the packing friction on the valve stem. Consequently, the increased friction stopped the MSIVs from going full closed after the valve disc lost momentum in the closed direction because of the partial vacuum that was created in the actuator.

Technical Specification 3.5.1.f required that the MSIVs be capable of going closed within 5 seconds under no flow conditions. System engineering was not able to precisely predict when packing friction increased to the point that precluded full closure of the MSIVs under no flow conditions. Therefore, the licensee assumed that the valves would not have satisfied the requirements of TS 3.5.1.f from the last time it was demonstrated that the MSIVs would go full closed under no flow conditions on May 29, 1998, until the condition was corrected on December 19, 1998.

The licensee's corrective actions, as documented in the evaluation of Condition Report C-PAL-98-1942, were considered thorough. The corrective actions that have been completed included: 1) removal of the vent plugs that increased the size of the actuator atmospheric side vent to preclude the partial vacuum in the actuator when closing the MSIVs; and 2) reduced the packing torque on the MSIVs until consistent travel to the full closed seat was demonstrated. System engineering personnel also identified that inadequate test methods and test procedures contributed to the failure. The planned corrective actions included appropriate revisions to the applicable testing procedures and methods.

Failure of the MSIVs to be capable of being fully closed under no flow conditions while the plant was above 300°F is a violation of TS 3.5.1.f. This non-repetitive, licensee-identified and corrected violation is being treated as a Non-Cited Violation, (50-255/98022-04(DRP)) consistent with Section VII.B.1 of the NRC Enforcement Policy.

The MSIVs were subsequently tested satisfactorily on December 19, 1998, and therefore, were in compliance with TS requirements. Also, the licensee concluded that the MSIVs were functional at all times in that they would have closed to perform their containment isolation safety function under accident conditions because of the amount of differential pressure that would be present across the valves. Therefore, the potential adverse safety consequences were minimal.

In addition, the inspectors noted that system engineering personnel appropriately evaluated the failure of the MSIVs in accordance with the maintenance rule and determined that the failure was a maintenance preventable functional failure. The evaluation was considered rigorous.

E2.2 Pressurizer PORV Inoperable Position Indication Lights

a. Inspection Scope (37551, 71707)

The inspectors reviewed the circumstances related to the problems identified with PORV position indicating lights. The operational impact of the PORV indication problems are discussed in Section 01.2 of this report.

The inspectors reviewed applicable control room logs, condition reports, TSs, and surveillance procedures. Also, the inspectors reviewed the root cause analysis and the Updated Final Safety Analysis Report.

b. Observations and Findings

On December 14, 1998, pressurizer PORV-1043B was stroked open by control room operators in preparation for establishing low temperature overpressure protection during the start of the forced outage. The open indication (red light) did not illuminate. Condition Report 98-1937 was generated to document the deficiency. Subsequent troubleshooting identified that a bracket was loose on the position indication limit switches. The bracket was tightened and the valve was subsequently stroked satisfactorily. Similar problems regarding PORV position indication occurred during the outage on December 27 and December 28, 1998. The position indication was repaired following each instance.

Subsequently, on January 5, 1999, the PORVs were stroked for post maintenance testing. The inspectors considered the post maintenance testing thorough in that it opened the valves in a "cold" condition (room temperature with no process steam flow in the line between the block valve and the PORV) and also required the valves to be opened "hot" (process steam in the line between the block valve and the PORV to allow the PORV to heat up). The testing was designed to recreate the conditions that existed when the valve position indication lights first failed on December 14, 1998.

When the PORVs were opened "cold," the position indication worked as designed for both valves. Subsequently, the PORV block valves were opened, one at a time, to heat up the line to the PORVs. When the PORVs were stroked following the heat-up, PORV 1042B indicated intermediate (red and green light out) and PORV 1043B indicated closed (green light on, red light out) with no apparent change in valve position. When both valves were stroked approximately 3 hours later, PORV 1042B indication worked as designed and PORV 1043B again indicated closed with no apparent change in valve position. However, quench tank pressure and level both increased when the PORVs were stroked which confirmed that the valves actually opened. Condition Report C-PAL-99-0020 was generated to document this deficiency and both PORVs were declared inoperable on January 5, 1999, for troubleshooting.

System engineering conducted extensive testing on the PORVs and also consulted with the vendor. The testing revealed inconsistent position indication (red/green lights in control room) results and therefore, the position indication switches were declared inoperable for both PORVs pending further repairs. The inoperable position indication lights in the control room created an operator work around that had minimal impact on the operators. Technical Specification 3.17.6 required that the failed position indication be repaired prior to the next startup from cold shutdown.

Operability of the PORVs was also questioned because of the inconsistent position indication results. System engineering analyzed the test data and recommended that the PORVs be declared operable. The following reasons were included in the operability determination:

- Non-intrusive acoustic monitoring results indicated that the valves fully stroked under both hot and cold conditions.

- Free valve travel to the full open and closed positions was apparent with differential pressure across the valve.

- Wavebook diagnostic equipment that monitored the PORV audio monitor, open and closed limit switches, and voltage and current to the solenoid was utilized during hot cycling. The information obtained showed indications of fluttering (full closed to full open) which correlated well to the audio signatures and quench tank pressure change, and therefore indicated flow through the valves.

- There was some evidence that valve 1043B ended in an intermediate position (not full open) when cycled hot with no differential pressure across the valve. However, based on discussions with the vendor representative and all diagnostic results, it was concluded that the valve would fully open with the system pressurized.

The inspectors noted the PORV block valves are closed to isolate the PORVs during normal operations at power because credit was not taken for operation of the PORVs in the plant transient accident safety analysis. The PORVs were designed to protect the primary coolant system from overpressure during abnormal transients associated with low temperature (less than 430°F), water solid system operations. The PORVs would also be required to function for a "feed and bleed" evolution as a contingency action to cool the primary coolant system during an emergency shutdown. The inspectors considered the operability recommendation that was developed by system engineering personnel as thorough in that it addressed the various design functions of the PORVs. The PORVs were declared operable on January 6, 1999.

c. <u>Conclusions Regarding Engineering Support of Facilities and Equipment</u>

The inspectors concluded that engineering personnel conducted thorough testing and performed an in depth analysis regarding the failure of the MSIVs to close which was determined to be a maintenance preventable functional failure. Inoperability of the MSIVs from May 29, 1998, until the condition was corrected on December 19, 1998, was a Non-Cited Violation.

Engineering personnel conducted extensive testing on the pressurize PORVs and provided a thorough operability recommendation to operations. However, an operator work around was created in that the PORV position indication lights remained inoperable pending required repairs prior to plant start-up following the next time the plant is in cold shutdown.

E4 Engineering Staff Knowledge and Performance

E4.1 Inadequate Primary Coolant Pump Oil Collection System

a. Inspection Scope (37551)

The inspectors reviewed various phases of Primary Coolant Pump P-50D oil leak repairs, applicable condition reports, and Design Basis Document 2.04, "Primary Coolant System."

b. Observations and Findings

On December 17, 1998, system engineering personnel identified that the primary coolant pump's oil collection system was inadequate. Appendix R, Section III.O, of 10 CFR Part 50, required that each primary coolant pump be provided with a lube oil collection system that was sized to contain the entire lube oil system inventory. The oil collection tanks associated with the primary coolant pumps were sized based on a nominal capacity of the upper reservoir of 62 gallons and the lower reservoir of 18 gallons. The collection tank capacity for P-50D, based on tank dimensions, was 91 gallons.

However, a total of 84 gallons was added to the upper reservoir for Primary Coolant Pump P-50D following oil leak repairs. Therefore, the 84 gallons in the upper reservoir, when combined with the nominal 18 gallons in the lower reservoir, exceeded the capacity of the oil collection tank. Consequently, the oil collection tank on P-50D was outside the design basis and failed to meet the requirements of Appendix R. System engineering personnel demonstrated a positive questioning attitude that contributed to the identification of this issue. Condition Report C-PAL-99-1962 was written to document this non-compliance.

The inspectors noted that Design Basis Document 2.04, dated June 18, 1997, Section 3.4.4.6, "Fire Protection," stated that primary coolant pump oil collection system was validated by Engineering Analysis, EA-D-PAL-92-220, Revision 1, "Analysis of Adequacy of Oil Collection System for Primary Coolant Pumps P50A, B, C, and D," June 7, 1993. That engineering analysis apparently was a missed opportunity to identify that the oil collection system was inadequate which demonstrated a lack of rigor during performance of the analysis.

Further analysis by system engineering personnel determined that the upper and lower oil reservoir systems on the primary coolant pumps were independent of each other. Also, the oil collection system was sized to collect oil from the worst anticipated leak and not two totally separate oil reservoir leaks. Therefore, engineering personnel declared the oil collection system operable but degraded because it would collect all the oil for a leak from either the upper or lower reservoirs but not a simultaneous leak from both.

However, the oil collection system did not meet applicable 10 CFR Part 50, Appendix R, requirements. The adverse safety consequences were considered minimal because both the upper and lower oil reservoirs would have to fail concurrently to exceed the oil collection system's capacity. Also, if the upper and lower reservoirs both failed then the amount of oil that spilled onto the containment floor would be minimal and would not come into direct contact with any heated or ignition surfaces.

Licensee personnel reported this condition to the NRC in accordance with 10 CFR 50.73. The corrective actions were documented in the evaluation of Condition Report C-PAL-98-1962, and in Licensee Event Report 98-011. The licensee's planned corrective actions included requesting from the NRC an exemption from the 10 CFR Part 50, Appendix R, requirements. If the exemption was not granted then the oil collection tank capacity would be increased to be able to collect the entire inventory of the lube oil system. The corrective actions were considered to be reasonable and adequate.

The inadequate sizing of the primary coolant pumps' oil collection system is a violation of 10 CFR Part 50, Appendix R, Section III.O. This non-repetitive, licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (50-255/98022-05(DRP)).

E4.2 Primary Coolant Pump P-50A Pump Casing Leak (37551)

The inspectors reviewed the applicable condition reports and the leak investigation analysis. On December 14, 1998, with the plant in hot shutdown, system engineering conducted a walkdown of Primary Coolant Pump P-50A and identified a build-up of boric acid near the component cooling water inlet line to the pump. Condition Report C-PAL-98-1939 was generated to document the issue. System engineering conducted the walkdown to specifically check P-50A because boric acid buildup was identified, and subsequently cleaned, on the component cooling water inlet flange to P-50A and the surrounding area during the 1998 refueling outage. However, at that time, the boric acid buildup was incorrectly contributed to pump seal leakage.

System engineering personnel inspected all of the primary coolant pump casing studs on the other three primary coolant pumps in response to the identified degraded studs on P-50A. No other stud degradation or active leaks were identified. The inspectors concluded that the walkdown that was performed during this outage demonstrated a positive questioning attitude and a pro-active initiative by system engineering personnel that contributed to the identification of the leak on primary coolant pump P-50A.

c. Conclusions Regarding Engineering Staff Knowledge and Performance

The inspectors concluded that system engineering personnel demonstrated a positive questioning attitude during primary coolant pump oil leak repairs this outage which contributed to identifying the inadequate primary coolant pumps' oil collection system. However, engineering personnel missed an earlier opportunity to identify the deficiency during an engineering analysis that was conducted in the early 1990's. The inadequate primary coolant pumps' oil collection system was a Non-Cited Violation.

Also, the inspectors concluded that the walkdown that was performed during this outage demonstrated a positive questioning attitude and a pro-active initiative by system engineering personnel that contributed to the identification of the leak on Primary Coolant Pump P-50A.

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Radiological Protection (71750)

The inspectors conducted frequent plant tours and reviewed radiological protection dose management that was conducted during the forced outage. No deficiencies were noted during routine tours. The radiation dose received (9.20 person-REM) during the forced outage was less than the projected dose (10.45 person-REM) which demonstrated effective dose management. Also, a first time evolution was completed that flushed the shutdown cooling heat exchangers after shutdown cooling was secured by recirculating the water to the safety injection refueling water storage tank. The evolution effectively reduced post-outage dose rates in the area of the shutdown cooling heat exchangers (safeguards rooms) to pre-outage levels and reduced dose rates in the safeguards rooms which were routinely toured by plant personnel. The inspectors concluded that effective dose management was demonstrated during the outage. Also, flush of the shutdown cooling heat exchangers, a first time evolution, demonstrated a positive pro-active initiative to reduce radiation dose rates in plant areas that were routinely toured by plant personnel.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on January 12, 1999. The licensee acknowledged the findings presented and senior plant management indicated that an evaluation regarding the operator performance deficiencies that were identified during this outage would be conducted. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

T. J. Palmisano, Site Vice President
G. R. Boss, Operations Manager
P. D. Fitton, Manager, System Engineering
N. L. Haskell, Director, Licensing
D. G. Malone, Licensing
D. J. Malone, Acting Manager, Chemical and Radiological Services
R. L. Massa, Shift Operations Supervisor
D. W. Rogers, General Manager, Plant Operations
G. B. Szczotka, Manager, Nuclear Performance Assessment Department

NRC

R. G. Schaaf, Project Manager, NRR

INSPECTION PROCEDURES USED

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

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-255/98022-01	NCV	CCW system placed In a configuration that was contrary to procedural requirements
50-255/98022-02	EEI	Apparent failure to follow surveillance procedure
50-255/98022-03	VIO	Failure to submit engineering analysis for NRC review
50-255/98022-04	NCV	Failure of the MSIVs to be capable of closing fully under no flow conditions
50-255/98022-05	NCV	Inadequately sized primary coolant pumps' oil collection system

Closed

50-255/98-007	LER	High pressure safety injection system inoperability.
50-255/98022-01	NCV	CCW system placed in a configuration that was contrary to procedural requirements
50-255/98022-04	NCV	Failure of the MSIVs to be capable of closing fully under no flow conditions
50-255/98022-05	NCV	Inadequately sized primary coolant pumps' oil collection system

Discussed

None