ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

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Report No.:	50-298/98-05
Licensee:	Nebraska Public Power District
Facility:	Cooper Nuclear Station
Location:	P.O. Box 98 Brownville, Nebraska
Dates:	July 12 through August 22, 1998
Inspectors:	M. Miller, Senior Resident Inspector C. Skinner, Resident Inspector
Approved By:	C. Marschall, Chief, Branch C Division of Reactor Projects

ATTACHMENT: Supplemental Information

EXECUTIVE SUMMARY

Cooper Nuclear Station
NRC Inspection Report 50-298/98-05

Operations

- Plant management was generally successful in demanding support and improved standards from the licensee organization. Although performance has improved over time, continued management attention to improving problem identification and resolution is warranted (Section O1.1).

- Operators maintained good control room formality, routinely demonstrated self-checking and peer-checking, used two-part communication in response to annunciators and other plant parameters, and routinely used three-part communication while providing instructions to other operators and maintenance craft. In addition, vigilance and high standards prevented a number of operational errors, especially during implementation of Improved Technical Specifications (Section O1.2).

- The licensee did not address all relevant aspects of the safety function of a degraded service water valve until questioned by inspectors. Subsequent testing demonstrated that the valve remained operable despite the degraded condition. This demonstrated a lack of questioning attitude and a failure to understand operability requirements. Although no violations of NRC requirements occurred, significant inspector involvement was required to ensure that the licensee addressed all consequences of the valve failure (Section O4.1).

- The licensee's failure to perform a valid common cause evaluation is an example where the licensee's implemented corrective actions did not address the concern. After many months and inspector involvement, the licensee re-performed the common cause evaluation, and the evaluation demonstrated that there was no common mode failure; therefore, the safety consequences were minimal (Section O8.1).

- As a result of untimely implementation of corrective actions, the licensee failed to prevent a fifth example of improperly restoring a radiation monitor to service. After inspector involvement, the licensee implemented acceptable interim corrective actions and expedited appropriate permanent corrective actions.

Maintenance

- On two occasions, Diesel Generator 1 failed to reach rated speed on demand, after several successful postmaintenance testing and monthly surveillance testing demands. The root cause appeared to be incorrect work instructions for setting the lube oil pump end clearances 7 months prior to the failures. This will be tracked as an inspection followup item to determine the impact on operability (Section M2.2).

- The licensee failed to recognize that replacement relays that failed testing, but actually remained operable, were an indication that testing requirements had not been fully evaluated or understood by engineering or maintenance. Significant inspector involvement was required to obtain recognition of this concern (Section M2.3).

- Mechanics reassembling diesel generator air system check valves were not knowledgeable of the work package and failed to follow the work instructions. The work instructions were inadequate because the restoration steps would have increased the risk of damaging the O-rings, and incorrect drawings were incorporated into the work packages. The licensee's corrective actions failed to address or correct all the problems identified. The licensee had not completed formulation of corrective actions prior to the end of the inspection period (Section M3.1).

- The corrective action program found an example of inadequate corrective action, but did not identify and document this as a condition adverse to quality. This failure to identify and document inadequate corrective actions was typical of those identified by the corrective action review group. This concern had no direct safety significance, but is noteworthy since the quality of corrective actions has been a long-standing concern (Section M8.1).

Engineering

- The licensee identified that an improperly installed check valve allowed a siphon from the suppression pool to the radwaste system via the reactor core isolation cooling barometric condenser. The licensee promptly corrected the condition, identified other cases in diesel generator air and containment isolation systems where these valves were improperly installed, and promptly corrected or evaluated them to be operable. Engineering response to this issue demonstrated an example of significantly stronger timeliness of response, breadth of technical review scope, correction of extent of condition, and coordination and support of plant activities (Section E2.1).

- The licensee failed to prioritize contracted efforts planned over several months to address instrument loop uncertainty for Technical Specification equipment, the control room did not obtain timely resolution of reactor equipment cooling system temperature indicator instrument loop uncertainty, and an appropriately conservative administrative limit for the maximum temperature was not set. Also, the station operations review committee identified and corrected a specific failure to address instrument uncertainty in troubleshooting instructions and with plant procedures, but failed to address the programmatic nature of the issue and require changes to administrative procedures (Section E8.2).

Report Details

Summary of Plant Status

The plant operated at 100 percent power at the beginning of this report period. On August 18, 1998, power was reduced to 95 percent to adjust control rods and was returned to 100 percent that same day.

I. Operations

O1 Conduct of Operations

O1.1 Plant Management Intervention to Raise Standards

a. Inspection Scope (71707)

Inspectors observed plan-of-the-day meetings, condition review group meetings, station operations review committee meetings, and several scheduled and impromptu meetings in which plant management participated.

b. Observations and Findings

During plant meetings, inspectors noted that plant management provided continuing clarification and increased expectations for plant staff, such as reduction of operator work-arounds. Also, plant management emphasized expectations for improved performance to resolve specific problems in many areas, such as work scheduling and problem identification and resolution. One example was corrective action in response to a failure to perform a test. Plant management monitored the operations and maintenance departments' efforts to simultaneously plan for an outage and test the valves. In addition, plant management initiated a task force to determine the extent of condition for missed tests and resolve why initiatives in 1994 and 1995 had not identified this test requirement. Another example was plant management's successful demands for resolution of long-standing temporary modifications by engineering. These efforts to obtain better performance were successful for specific issues. Although performance has improved over time, continued management attention to improving problem identification and resolution is warranted.

c. Conclusion

Plant management was generally successful in demanding support and improved standards from the licensee organization. Although performance has improved over time, continued management attention to improving problem identification and resolution is warranted to preclude the continuing occurrence of similar performance problems.

O1.2 Control Room Crew Effectiveness

a. Inspection Scope (71707)

Inspectors observed control room actions as routine tasks were implemented and reviewed control room logs, night orders, and selected operability evaluations. Inspectors held discussions with operations crew members and management.

b. Observations and Findings

Control board and station operators used peer-checking and self-checking while operating equipment. Crews used three-part communications during surveillances, alarm response, and routine operations in the control room. The control room crews demanded good performance and coordination from engineering and maintenance craft while resolving issues, troubleshooting and addressing operability. These demands were usually successful and usually resulted in more timely, complete, and accurate response to issues. One example involved a reactor operator's identification of the need to lower water level to prevent a high torus level prior to starting a scheduled radwaste outage. Another example involved timely action by a shift technical engineer to preclude incorrect valve lineups of radiation monitors.

The licensee implemented Improved Technical Specifications on August 15. Operators and shift technical engineers demonstrated vigilance during implementation. Inspectors observed several examples where an outstanding questioning attitude by crew members avoided improper or incomplete implementation of Improved Technical Specifications. An example involved valves that had not been tested as required. Operations and maintenance staff satisfactorily tested the valves within the action statement requirements.

Inspectors noted an exception to this good level of performance when the crew did not successfully obtain information from engineering in a timely manner regarding the accuracy of reactor equipment cooling temperature indication, when the temperature approached operability limits. This issue is discussed further in Section E8.2.

c. Conclusions

Operators maintained good control room formality, routinely demonstrated self-checking and peer-checking, used two-part communication in response to annunciators and other plant parameters, and routinely used three-part communication while providing instructions to other operators and maintenance craft. In addition, vigilance and high standards prevented a number of operational errors, especially during implementation of Improved Technical Specifications.

O4 Operator Knowledge and Performance

O4.1 Inadequate Operability Evaluation for an Essential Service Water Valve Failure

a. Inspection Scope (71707)

The inspectors monitored the licensee's troubleshooting activities and operability evaluations when the Reactor Equipment Cooling Heat Exchanger Service Water Outlet Valve SW-MOV-650 failed to fully close. Discussions were held with operations, engineering, and plant management.

b. Observations and Findings

On July 23, 1998, during routine surveillance testing, Reactor Equipment Cooling Heat Exchanger Service Water Outlet Valve SW-MOV-650 failed to fully close. Design Criteria Document 3, "Service Water and Residual Heat Removal Service Water System," indicated two design functions for the valve - to allow at least 1200 gpm flow during normal operations and to restrict flow to 400 gpm during accident conditions to ensure adequate service water flow to diesel and residual heat removal system heat exchangers.

The inspectors reviewed the licensee's operability determination, which stated that Service Water Loop A was inoperable. The operability determination did not address effects on the service water supply to Residual Heat Removal Heat Exchanger A and Diesel Generator 1, although the service water system provided cooling water to these systems for decay heat removal. Additionally, the licensee did not know the cause of the failure or if the valve would degrade further, but concluded that no evaluation of the valve failure effects on the other systems required consideration. This position indicated a lack of consideration of the valve's intended safety function during evaluation of operability.

After discussions with plant management, an operability determination was performed on July 25, which concluded that both the residual heat removal heat exchanger and diesel generator had been operable based on a test performed on July 24. The test confirmed that the failure was repeatable and the valve was able to perform its safety function of restricting flow to less than 400 gpm. For subsequent testing on July 26, the licensee blocked the valve open, and had not planned to declare the diesel or residual heat removal systems inoperable for that test, until after inspector involvement in this issue.

c. Conclusion

The licensee did not address all relevant aspects of the safety function of a degraded service water valve until questioned by inspectors. Subsequent testing demonstrated that the valve remained operable despite the degraded condition. This demonstrated a lack of questioning attitude and a failure to understand operability requirements.

Although no violations of NRC requirements occurred, significant inspector involvement was required to avoid a violation, and to ensure that the licensee addressed all consequences of the valve failure.

O8 Miscellaneous Operations Issues

O8.1 (Closed) Violation 50-298/96026-01: No documentation for Technical Specification surveillance requirement. This violation involved two events in which Diesel Generator 2 was declared inoperable and completion of Technical Specification Surveillance Requirement 4.5.F.1, common cause failure evaluation of the operable diesel generator, was not documented. In NRC Inspection Report 50-298/97-08 the inspectors verified and documented that the licensee's corrective action was completed, except that the second common cause evaluation was not valid and the procedures to implement the Technical Specifications requirements had not been put in place.

As of August 24, 1998, no changes had been made to the original inadequate common cause evaluation performed on the second diesel generator failure. The licensee performed a new common cause evaluation that determined the original root cause evaluation was wrong. The new evaluation concluded that a voltage transient caused the zener diode failure. An incorrectly oriented potentiometer motor and loose and misaligned positioning gears caused the voltage transient. Workers inspected the potentiometer motor and positioning gears on the other diesel generator with no problems noted, demonstrating that the other diesel generator was not susceptible to a similar failure.

The licensee implemented Procedure 0.5.1, "Operations Review of Problem Identification Reports/Operability Determinations/Evaluations," Revision 3c2, which contained steps that provided guidance regarding evaluation of common cause failures for the diesel generators. Inspectors considered these steps appropriate.

The licensee's failure to perform a valid common cause evaluation for a diesel failure is an example of corrective actions that did not address the concern. After many months and inspector involvement, the licensee re-performed the common cause evaluation and demonstrated that no common mode failure occurred. As a result of the evaluation, the inspectors concluded that the safety consequences were minimal. The inspectors considered the licensee's actions sufficient to close this item.

O8.2 (Open) Violation 50-298/97012-03 Multiple examples of failures to correct problems. Inspectors identified multiple cases of the licensee's failure to correct problems, including failures to properly return radiation monitors to service.

The licensee identified a fifth example of a radiation monitor that had been improperly restored to service, with the sample intake monitoring the local equipment room rather than monitoring the building ventilation system as designed. The licensee had not yet implemented permanent corrective actions for this problem, although several alternatives were under evaluation. Since no release occurred, this problem had no

safety consequence. This was an additional example of the violation cited in NRC Inspection Report 50-298/97-12. At the time of this problem, the corrective actions for the past violation were in progress and had not been implemented.

The inspectors identified that corrective actions were not timely. In response, the licensee implemented a second check and verification during system restoration to ensure that the system was properly restored. Planned permanent corrective actions involved transfer of system restoration ownership to the chemistry department rather than the current situation of three departments (chemistry, radiation protection, and operations), and restructuring of the radiation monitor maintenance and restoration procedure. Inspectors considered these actions appropriate.

c. Conclusions

As a result of untimely implementation of corrective actions, the licensee failed to prevent a fifth example of improperly restoring a radiation monitor to service. After inspector involvement, the licensee implemented acceptable interim corrective actions and expedited appropriate permanent corrective actions.

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments

a. Inspection Scope (61726 and/or 62707)

Inspectors reviewed work packages and clearances and held discussions with maintenance craft, planning, work control staff, and management. Inspectors observed the following maintenance activities:

Preventive Maintenance 10417	Change the diesel generator fuel oil filters
Preventive Maintenance 10419	Change the diesel generator turbocharger lube oil filters
Preventive Maintenance 09703	Remove and inspect Check Valve DGSA-CV-19CV
Preventive Maintenance 07447	Remove and inspect Check Valve DGSA-CV-18CV
Procedure 7.1.0.7, "Troubleshooting" addendum to Problem Identification Report 2-30366	Troubleshooting plans for Valve SW-MOV-650

Surveillance Procedure 6.RHR.306 Reactor High Pressure Channel Calibration

b. Observations and Findings

Engineering presence was observed throughout most of the work activities and strong maintenance adherence to procedures and awareness of work package control practices was observed. Maintenance supervision, management, and engineering staff were observed at job sites. Exceptions to these general practices are documented later in this request.

c. Conclusions

Overall, the maintenance activities observed were well-controlled and performed in a step-by-step manner. Maintenance supervision and engineering staff were observed present at the job sites more often than in past report periods.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Plant Material Condition

a. Inspection Scope (62707)

Inspectors performed plant walkdowns, observed maintenance, reviewed a sample of maintenance activity records, and attended plant meetings during this inspection period. Inspectors held discussions with various licensee staff and management.

b. Observations and Findings

Inspectors assessed plant material condition during the course of the inspection. The following are examples of poor material condition.

- The turbine building radiation monitor was returned to service with the sample inlet taking a sample of the equipment room atmosphere rather than the turbine building. This was the fifth example in 2 years of radiation monitors being restored with incorrect sample flow inputs (Section O2.1).

- The service water outlet valve for the essential reactor equipment cooling heat exchanger failed to close. This could cause excessive service water flow through this portion of the service water piping, which would reduce flow to other service water loads, including the diesel generator and the residual heat removal heat exchanger, and cause these systems to be inoperable (Section O4.1).

- The diesel generator failed surveillance testing on three occasions, as a result of improperly performed maintenance (Section M2.3).

- Check Valves RCIC-CV-12 and -42 leaked by the seat, allowing torus water to

drain to the radioactive waste processing system outside secondary containment. The licensee identified that one of the check valves was installed in the wrong orientation. The licensee's investigation of the extent of condition identified 10 other incorrectly installed valves in the diesel generator starting air system and the primary containment system (Section E2.2).

c. Conclusions

Although inspectors observed several examples of degraded material condition, the examples were exceptions, many of which were minor. Overall plant material condition was good.

M2.2 Diesel Generator 1 Failure to Achieve Rated Speed and Load

a. Inspection Scope (62707 and 61726)

Inspectors reviewed evaluations, procedures, drawings, vendor manuals, problem identification reports, and licensee event reports associated with two failures of Diesel Generator 1 to start and load in November 1997. Inspectors held discussions with members of licensee staff and management.

b. Observations and Findings

During the April 1997 refueling outage, technicians performed Maintenance Work Request 96-1369, which changed the lube oil pump end clearance from 0.018 inches to 0.008 inches in order to permit use of the diesel slow start feature. The licensee did not address the potential effects of the smaller end clearance on the engine-driven lube oil pump. During postmaintenance testing, the diesel generator failed to start on the first attempt. The licensee's investigation determined that the lube oil system was not filled or vented properly and the incorrectly set end clearance was not identified at that time. The diesel generator started satisfactorily after the lube oil system was filled and vented. The plant restarted from the outage on May 19, 1997.

Diesel Generator 1 started successfully but failed to achieve rated speed of 600 rpm on demand on November 6, 1997. Instead, the engine increased to about 300 rpm for 1.5 minutes before shutting down. Two hours later, a second slow start was performed after fuel oil and lube oil system valve line-ups were performed. The diesel generator started. On the third start, a failure similar to the first occurred.

After the second failure, engineering concluded that low lube oil pressure caused the diesel generator to shut down. The licensee identified burned paint at various locations on the casing of the engine-driven lube oil pump. Disassembly of the lube oil pump found the shaft bearing surfaces burned and galled.

The licensee's root cause investigation determined that the clearances were incorrect and that there had been confusion between the maintenance planner and technical engineer who planned the work. The maintenance planner and the technical engineer

each obtained different information from the vendor representative, but neither obtained sufficient information to create an appropriate work package. As a result, Maintenance Work Request 96-1369 failed to use the vendor recommended end clearance of 0.014 to 0.20 inches. The failure to correctly set the end clearance for the engine-driven lube oil pump is an inspection followup item to determine the extent that the diesel engine was degraded (50-298/98005-02).

On November 8, the engine driven lube oil pump (with correct clearances) and filter were replaced under Maintenance Work Request 97-2269. The licensee analyzed the lubricating oil and verified that it did not indicate engine damage. As interim corrective action, the plant engineering manager and the maintenance planning supervisor required documentation of any technical information gathered from the vendor for maintenance repairs in a "record of telecon" report and inclusion of the information in the work package.

The licensee concluded that Diesel Generator 2 was not affected based on the fact that the licensee did not perform any work on the lube oil pump. This conclusion appeared reasonable.

c. Conclusions

On two occasions, Diesel Generator 1 failed to reach rated speed on demand, after several successful postmaintenance testing and monthly surveillance testing demands. The root cause appeared to be incorrect work instructions for setting the lube oil pump end clearances 7 months prior to the failures. This will be tracked as an inspection followup item to determine the impact on operability.

M2.3 Failure to Consider the Adequacy of the Test Method For Replacement Relays

a. Inspection Scope (62707)

Inspectors followed the licensee's resolution of installed relays that failed testing, but remained operable. Inspectors reviewed problem identification reports and held discussions with operations, maintenance, engineering, and management personnel.

b. Observations and Findings

On June 2, 1998, during preventive maintenance, some emergency core cooling system relays failed testing. The relays had been in service and had been evaluated to have been like-for-like replacements for the original design. The failures were a consequence of a nonessential aspect of the relay design, a relatively small change in the location and mass of a magnet in the relay from the previous design. This new relay design was incompatible with one of the types of testing by microprocessor test equipment, although that test had been appropriate for the previous design relays.

The licensee had not questioned the adequacy of the engineering evaluation that had failed to identify incompatible testing. The inspector questioned if an inoperable relay

could satisfactorily pass testing and incorrectly be determined to be operable. As of the end of the inspection period, the licensee had not completed their evaluation in response to this concern. The inspectors determined that the evaluation procedure had not clearly specified that testing of replacement components should be evaluated.

The licensee determined that maintenance made the decision of what test option to use for this relay, based on training of technicians on the microprocessor based test device. Engineering and maintenance were not effective in determining the appropriate test method.

On June 16, 1998, as part of a separate initiative on configuration management, engineering issued Procedure EDP-06, "Design Input," Revision 1, which listed several requirements for evaluation of testing requirements when evaluating changes to plant design. These requirements would have precluded improper testing for most concerns. In this case, engineering stated that the selection of the test method (pulse based or linear ramp) was selected by maintenance, rather than engineering. Engineering actions to address this issue with maintenance had not occurred from June 2 through the close of this inspection report.

The extent of condition and safety significance of inadequate testing evaluations has not been determined. The inspector identified this issue, and significant inspector involvement was required to achieve recognition of the issue. No corrective actions were planned as of the end of the inspection period, although further licensee actions identified that some of the software used to implement this testing was not subject to validation and verification. Since the safety significance of the specific relay issue is low, and the extent of condition of inadequate testing for replacement components is unknown at the close of this inspection period, the issue will be followed by an inspection followup item (50-298/98005-03)

c. Conclusion

The licensee failed to recognize that replacement relays that failed testing but actually remained operable were an indication that testing requirements had not been fully evaluated or understood by engineering or maintenance. Significant inspector involvement was required to obtain recognition of this concern.

M3 Maintenance Procedures and Documentation

M3.1 Problems Experienced During Maintenance on Diesel Generator Air Start Check Valves

a. Inspection Scope (62707)

The inspectors observed mechanics performing preventive maintenance on Diesel Generator Starting Air System Check Valves DGSA-CV-18CV and DGSA-CV-19CV. Discussions were held with the mechanics and with maintenance management.

b. Observations and Findings

On July 21, 1998, the inspectors observed maintenance performed on check valves in the diesel generator starting air system in accordance with Preventive Maintenances PM-09703 and PM-07447. The maintenance involved reassembly of the check valves, including installation of an O-ring.

The inspectors observed several problems with performance of the maintenance. The mechanics did not perform the check valve reassembly steps as written. The workers demonstrated a lack of familiarity with the work package, as demonstrated when a mechanic informed his supervisor that the work package did not contain a drawing, despite the fact that the package did, in fact, contain a drawing. However, this drawing was not the correct drawing for this valve work.

Through discussions with the mechanics, the inspectors found that, if the workers had performed the instruction steps performed as written, the O-ring had a greater possibility of being damaged. The inspectors also noted that the drawing included in the work package did not illustrate the washer installed in accordance with the work instructions. The licensee concluded that the correct drawing properly illustrated the washer.

Although the mechanics wrote Problem Identification Report 2-29903, it documented only the failure to perform the reassembly steps as written. The licensee stated that the omitted problems would be addressed in a condition adverse to quality evaluation being performed on similar issues. The problem occurred on July 21, but the problem identification report was not processed until August 19, 1998.

The maintenance supervisor had been informed that these issues would be addressed in a different document, Condition Adverse to Quality 98-0425. As a result, the maintenance supervisor did not promptly process the problem identification report.

The licensee added these issues to a condition adverse to quality that was performed for similar issues. The inspectors found that the corrective actions report neither addressed the failure to stop and correct the work instruction if the steps could not be performed, nor the procedural inadequacy. The corrective actions established additional barriers to identify inadequate packages and improve familiarity with the work package, but did not identify the root cause of the inadequate work instructions.

The failure of the mechanics to perform the reassembly steps as written and the procedural inadequacy of the work package are similar to Violation 50-298/97002-03. This violation had occurred because: (1) maintenance technicians failed to follow the procedure, and (2) the procedure was not adequate. Further, the issue was not processed in the problem identification report system until after inspector involvement. The licensee's reply to Notice of Violation, dated April 29, 1997, stated that corrective actions would consist of monitoring performance indicators to avoid further violations. The inspectors concluded that monitoring procedural adherence and adequacy after violations have occurred would not prevent further violations. As of the end of the inspection period, the licensee had not completed formulating corrective action for the

failures to follow or ensure the adequacy of maintenance work instructions. The failure to ensure adequate work instructions and adherence to maintenance procedures is an apparent violation. Pending review of licensee corrective actions, this will be tracked as an open item (50-298/98005-01).

c. Conclusion

Mechanics reassembling diesel generator air system check valves were not knowledgeable of the work package and failed to follow the work instructions. The work instructions were inadequate because the restoration steps would have increased the risk of damaging the O-rings, and an incorrect drawing was incorporated into the work package. The licensee's corrective actions failed to address or to correct all the problems identified. The licensee had not completed formulation of corrective actions prior to the end of the inspection period.

M8 Miscellaneous Maintenance Issues (92902)

M8.1 (Closed) Inspection Followup Item 50-298/97002-02: Diesel generator taper pins not installed, resulting in declaring both diesel generators inoperable. This inspection followup item was opened to track the licensee's root cause in determining why the missing taper pins were not installed during previous overhauls.

The evaluation (Problem Identification Report 2-07654) documented that the apparent cause was insufficient details in the procedures to ensure all taper pins were installed. It listed two corrective actions which were to replace all missing taper pins during Refueling Outage 17 (Spring 1997) and to torque all bracket mounting bolts, which the licensee performed. However, no procedures were revised, although the apparent cause was insufficient details in procedures. The evaluation and corrective actions were approved by the maintenance management as satisfactory. After a review by the corrective actions group, the report was closed.

On September 2, 1997, the corrective action group determined that maintenance procedures had not been corrected. The problem identification report was reopened and the procedure was corrected.

The second time the problem identification report was closed, appropriate corrective actions had been implemented. No corrective actions were taken to ensure that the first time an item is closed the corrective actions taken addressed the apparent or root cause. Corrective actions for the November 1997 violation, to trend quality of corrective actions, has not been put in place yet. This is an example where the line organization was not held accountable by the corrective action program to implement appropriate corrective actions. During discussion with inspectors, the licensee stated that corrective actions approved by line managers, which are later found to be inadequate or incomplete in scope by back end review, are typically not identified as a condition adverse to quality. This indicated a failure to identify and document failures of the line management to properly implement the corrective action program. Inspectors also

identified that the procedures implementing the corrective action program were vague with respect to past corrective action reviews and requirements to trend inadequate corrective actions. This concern had no direct safety significance, but is noteworthy since the quality of corrective actions has been a long-standing concern.

c. Conclusion

The corrective action program found an example of inadequate corrective action, but did not identify and document this as a condition adverse to quality. This failure to identify and document inadequate corrective actions was typical of those identified by the corrective action review group. This concern had no direct safety significance, but is noteworthy since the quality of corrective actions has been a long-standing concern.

M8.2 (Closed) Inspection Followup Item 50-298/97003-05: Chipped valve stem and nuts due to inadequate rigging practices. The inspectors identified two cases during valve overhaul where the ends of valve stems and edges of stem nuts were observed to have been chipped.

Problem Identification Report 2-15014 was written to determine why the valve stems and nuts were damaged. The licensee inspected Valve REC-MOV-700 and determined that the stem end was not tapered. Based on that determination, Problem Identification Report 2-15391 was written to inspect five other motor-operated valves (Valves SW-MOV-89A, REC-MOV-702MV, REC-MOV-704MV, REC-MOV-700MV, and RHR-MOV-MO13A) to determine the condition of other motor-operated valves. The five other valves inspected had beveled or tapered stem ends and no signs of damage or foreign material. Based on these inspections, the licensee concluded that the stem end and stem nut chipping resulted from stem end cutting during vendor assembly prior to delivery to the licensee. The inspectors considered the licensee's actions to resolve this issue appropriate.

M8.3 (Closed) Violation 50-298/97002-03: Failure to properly implement a procedure. Because the issues are similar, the corrective actions for this issue will be followed by Open Item 50-298/98005-01.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Siphoning of Torus Liquid Through Leaking Check Valves and Improper Installation of Check Valves

a. Inspection Scope (37551 and 93702)

Inspectors observed the licensee's response to their identification of a siphon occurring from the torus to radwaste via piping between the reactor core isolation cooling barometric condenser and the torus liquid volume. Inspectors held discussions with maintenance technicians, engineers, and managers.

b. Observations and Findings

After a scheduled reactor core isolation cooling system surveillance on June 11, 1998, operators noted unexpected operations of the barometric condenser discharge line valves, indicating a high level signal in the barometric condenser and a need to discharge liquid buildup in the condenser to radwaste. Prompt investigation found torus water leaking through check valves (RCIC-CV-12 and -42) to the barometric condenser. The line was isolated with a manual valve, and the barometric condenser was disabled.

An evaluation (IEE 98-5018) concluded that the reactor core isolation was operable without the barometric condenser, and local radiation levels and airborne contamination levels would not be significantly increased under a design basis scenario.

The licensee also evaluated primary containment operability during the 4.5 hours before the line was isolated. Evaluation IEE 98-5019 concluded that, because the line was water-filled, the torus was capable of performing it's safety function between the time that the monthly surveillance run was secured and the time that the isolation valve was shut. Inspectors noted that the evaluation did not address the potential effects of a design basis accident during this period. The torus pressure would be expected to increase significantly, and the source term radiation levels would be expected to increase. As a result, the flow rates and differential pressures would change, and the ability to enter the area and close the manual isolation valve may have been significantly challenged. Also, the time period and system configuration during the reactor core isolation cooling surveillance, during which the valve may have become degraded, was not addressed.

Engineering investigated promptly and determined that Check Valve RCIC-CV-12, which functioned as a primary (water filled line) containment isolation valve had been installed 90 degrees out of alignment, which was inconsistent with the requirements of Note 9 of the check valve installation and design drawing, Drawing N04-2487-500, ASSY-CV1B-SSV-N3, Wafer Check Valve, Size D, Revision C. Note 9 required that the valve be installed in a horizontal line with the hinge pin centerline vertical or in a vertical line with flow upward. The valve was located in a horizontal line with the hinge pin centerline horizontal. Therefore the flapper did not pivot through a horizontal plane as required and was required to overcome gravitational force plus expected design frictional and drag forces. The licensee issued a nuclear network entry to alert other licensees to this vulnerability.

The licensee re-oriented the valve to correct the condition. The licensee's investigation of the extent of condition identified that 10 other valves of this design had been installed

with improper orientation. An operability evaluation was performed which concluded that the eight diesel air start system valves and two primary containment isolation valves were operable. Diesel Generator 1 check valves were returned to the design orientation. Diesel Generator 2 and primary containment isolation valves were scheduled during the next work outage for the associated systems.

The engineering staff responded to this issue immediately and coordinated with maintenance and operations to promptly correct the concern. Inspectors observed significant involvement of engineering management with engineering staff and repeated articulation of standards for timely and complete technical work and effective coordination with operations and maintenance. Some intervention by plant management was required to obtain more effective coordination but, in general, the timeliness and extent of technical support was strong and effectively run by engineering.

The inspector identified that, after the degraded condition was corrected, followup evaluation of past operability was not provided to operations, but to licensing, for reportability purposes. Operations initiated discussions with engineering to correct this practice.

The inspectors will follow this issue with an inspection followup item to resolve the high flow rate and pressure at Valve RCIC-RV-12RV, past operability of the primary containment isolation function for all affected primary containment valves, and the failure to provide operability evaluation updates to operations (50-298/98005-04).

c. Conclusion

The licensee identified that an improperly installed check valve allowed a siphon from the suppression pool to the radwaste system via the reactor core isolation cooling system barometric condenser. The licensee promptly corrected the condition, identified other cases in diesel generator air and containment isolation systems where these valves were improperly installed, and promptly corrected or evaluated them to be operable. Engineering response to this issue demonstrated significantly improved response timeliness, breadth of technical review scope, correction of extent of condition, and coordination and support of plant activities.

E8 Miscellaneous Engineering Issues

E8.1 (Closed) Unresolved Item 50-298/98002-07: Air-filled service water piping and residual heat removal heat exchanger. Inspection Followup Item 50-298/97011-04 already tracked this item; therefore, the unresolved item is closed and the results of followup inspections will be tracked by the inspection followup item.

E8.2 (Open) Inspection Followup Item 50-298/96026-06: Failure to properly address instrument uncertainty for nonautomatic-actuating instruments. Three recent issues were identified. The licensee assigned a contract to evaluate and quantify Technical Specifications instrument loop uncertainty. The contract has not been awarded, but the

job scope description had been provided to several vendors who submitted bids. The inspector identified that the contract had not included prioritization of safety-significant instrument loops or higher risk loops, relative to the lower safety-significant loops. The licensee agreed that this prioritization issue would be addressed.

A separate issue was a July 24, 1998, station operations committee meeting where the troubleshooting instructions for Valve SW-MOV-650 were discussed. During this meeting, station operations review committee members identified that the troubleshooting instructions did not take into account instrument uncertainty, that plant procedures would need to be revised to include instrument uncertainty and that the control room would need guidance to implement the correct temperature limits. The troubleshooting instruction was revised to incorporate instrument uncertainty and a standing order was implemented that stated, if the reactor equipment cooling outlet temperature reached 92 degrees, an immediate plant shutdown was to commence.

The inspectors noted that the station operation review committee corrected this specific issue with reactor equipment cooling system temperature instrument uncertainty, but failed to address instrument uncertainty as a programmatic issue. The overall troubleshooting procedure was not revised to address the reduced margin of system operability to account for instrument uncertainty during troubleshooting and implementation of compensatory measures.

Although no violation of NRC requirements occurred, considerable inspector involvement was required before the programmatic aspects of the issue were recognized.

Another issue concerning instrument uncertainty was identified by the control room staff. However, inspector intervention was required before the licensee addressed the effects of instrument error associated with high reactor equipment cooling temperatures in a manner timely enough to ensure sufficient margin to operability.

c. Conclusion

The licensee did not prioritize efforts to address instrument loop uncertainty for Technical Specification equipment. The control room did not obtain timely resolution of reactor equipment cooling system temperature indicator instrument loop uncertainty, and an appropriately conservative administrative limit for the maximum temperature was not set. Although the station operations review committee identified and corrected a specific failure to address instrument uncertainty in troubleshooting instructions, it failed to address the programmatic nature of the issue and require changes to plant troubleshooting procedures.

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at an exit meeting on August 20, 1998. A second meeting was conducted on August 31 to

clarify later developments in several of the issues documented in this report. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

Licensee

M. Boyce, Plant Engineering Manager
D. Buman, Assistant Plant Engineering Manager
J. Burton, Performance Analysis Manager
P. Caudill, General Manager, Technical Services
T. Chard, Radiological Manager
P. Donahue, Engineering Services Department Manager
C. Fidler, Assistant Maintenance Manager
*C. Gaines, Maintenance Manager
T. Gifford, Design Engineering Manager
M. Gillan, Assistant to the Plant Manager
L. Hodges, Assistant to Vice President
M. Kaul, Shift Supervisor/Operations
D. Kunsemiller, Consultant, Licensing
*D. Madsen, Senior Licensing Engineer
*J. Peters, Licensing Secretary
*B. Rash, Senior Manager of Engineering
*A. Shiever, Acting Plant Manager, Operations Manager
*J. Sumpter, Licensing Supervisor
*M. Tackett, Shift Supervisor

NRC:

C. Marschall, Chief, Branch C, Region IV

*Indicates persons attending both the August 20 and 31, 1998, meetings.

INSPECTION PROCEDURES USED

IP 37551: Onsite Engineering
IP 61726: Surveillance Observation
IP 62707: Maintenance Observation
IP 71707: Plant Operations
IP 71750: Plant Support Activities
IP 92901: Followup - Plant Operations
IP 92902: Followup - Maintenance
IP 92903: Followup - Engineering
IP 93702: Prompt Onsite Response to Events at Operating Power Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-298/98005-01	EEI	Example of failures to implement 10 CFR 50, Appendix B, Criterion XVI (Section M3.1).

50-298/98005-02	IFI	Diesel Generator Lube Oil Failures (Section M2.3)
50-298/98005-03	IFI	Failure to specify testing for replacement relays (Section M2.4).
50-298/98005-04	IFI	Past operability of primary containment isolation and potential for relief valve lift (Section E2.2).

Closed

50-298/96026-01	VIO	No documentation for Technical Specification surveillance requirement (Section O8.1).
50-298/97002-02	IFI	Diesel generator taper pins not installed (Section M8.1).
50-298/97003-05	IFI	Chipped valve stem and nuts due to inadequate rigging practices (Section M8.2).
50-298/97002-03	VIO	Failure to properly implement a procedure (Section M8.3).
50-298/98002-07	UNR	Air filled service water piping and residual heat removal heat exchanger (Section E8.1).

Discussed

50-298/97012-03	VIO	Multiple examples of failures to correct problems (Section O8.2).
50-298/98003-02	IFI	Reactor equipment cooling surveillance inadequate (Section M2.2).
50-298/98002-07	URI	Operability evaluation of service water in air filled condition (Section E8.1).
50-298/96026-06	IFI	Failure to properly address instrument uncertainty for nonautomatic-actuating instruments (Section E8.2).