APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-285/93-24

Operating License: DPR-40

Licensee: Omaha Public Power District
Fort Calhoun Station FC-2-4 Adm.
P.O. Box 399, Hwy. 75 - North of Fort Calhoun
Fort Calhoun, Nebraska

Facility Name: Fort Calhoun Station

Inspection At: Blair, Nebraska

Inspection Conducted: October 10 through November 20, 1993

Inspectors: R. Mullikin, Senior Resident Inspector
R. Azua, Resident Inspector

Approved: Thomas F. Stetka
Thomas F. Stetka, Chief, Project Section D

12/17/93
Date

Inspection Summary

Areas Inspected: Routine, unannounced inspection of operational safety verification, maintenance and surveillance observations, refueling activities, and engineered safety features walkdown.

Results:

- Failure of the rod control system to function properly was the subject of an Augmented Inspection Team (Section 2.2).
- Operator response to inaccurate nuclear instrumentation readings was conservative. Management exhibited a heightened concern for personnel safety (Section 2.1).
- Operator performance was very good during routine control room activities (Section 3.1).
- The security program was properly implemented. Response to the providing of the wrong badge to an individual was very good (Section 3.3).
- Increased attention was needed for temporary outage personnel for operational safety and radiation work practices (Sections 3.2.1 and 3.4).

- Health physics coverage and as-low-as-reasonably-achievable (ALARA) practices were very good (Section 3.4).

- Maintenance activities were performed in a very good manner with adherence to procedures. Prejob briefings held prior to maintenance was excellent (Section 4).

- Surveillance activities were performed in an excellent manner with adherence to procedures. The prejob briefing held prior to a complex surveillance test was excellent (Section 5).

- Refueling activities were found to be good. Refueling operators demonstrated a nonquestioning attitude when foreign particles were observed in the refueling cavity (Section 6).

Summary of Inspection Findings:

- None

Attachment:

- Attachment - Persons Contacted and Exit Meeting

DETAILS

1 PLANT STATUS

The Fort Calhoun Station was in its 14th refueling outage during this inspection period.

2 ONSITE RESPONSE TO EVENTS (93702)

2.1 Manual Initiation of Emergency Boration and Containment Evacuation

On November 9, 1993, the licensee raised the pressurizer water level from 50 percent to 70 percent. This activity was performed in preparation for the containment integrated leak rate test (CILRT). While the pressurizer level was being raised, the source range monitor nuclear instrumentation wide range Channels A and D indicated that a rapid neutron count rate increase had occurred (10^{-07} percent to 10^{-05} percent reactor power). The source range monitor nuclear instrumentation wide range Channels B and C indications were noted to remain at 10^{-07} percent reactor power. The operators appropriately responded to the nuclear instruments which indicated that an inadvertent reactor coolant dilution event had occurred. The operators responded in accordance with the abnormal procedure requirements by manually initiating the emergency boration system and ordered a containment evacuation.

Emergency boration of the reactor coolant system was secured approximately 10 minutes after it had been started when Channels A and D indications returned to 10^{-07} percent reactor power. Reactor coolant system chemistry samples were then taken to determine the reactor coolant system boron concentration. The licensee determined that the Technical Specification required minimum shutdown margin (5 percent) had been maintained throughout the event. Prior to the emergency boration the calculated shutdown margin was 6.5 percent. Subsequently, the shutdown margin was determined to be 7.5 percent.

Instrumentation and controls technicians identified that an electrical noise within Channel A had caused a similar response on Channel D. The technicians readjusted the wiring to the fission chamber that fed data to Channel A, which successfully suppressed the electrical noise. Subsequent attempts to recreate and identify the source of the noise were not successful. The licensee believed that the noise in Channel A induced the noise in Channel D because of the way associated interconnected scaler counter coaxial cables were shielded.

The licensee was able to replicate the problem in Channel D by intentionally inducing noise in Channel A and, thus, determined that reactor power had not changed but had remained at 10^{-07} percent. Based on this information, the licensee determined that the source range monitor nuclear instrumentation indications provided by Channels A and D had been erroneous. Channels B and C were determined to have met the plant refueling Technical Specification source range monitor nuclear instrumentation operability requirement.

One hour after containment evacuation had been directed, and after it had been determined that there had not been an increase in core reactivity, operations management granted permission for plant personnel to reenter the containment building. As a precautionary measure, management requested that radiation protection personnel accompany workers to their work areas in the containment to verify that posted surveys were still accurate.

The licensee was unable to positively determine the cause for the Channel A noise. No additional noise problems have been noted. The licensee was continuing its investigation into the causes of the noise and has been in contact with the nuclear instrumentation vendor. A complete review of the licensee's corrective actions will be performed during the followup to the associated licensee event report (LER 93-015).

2.2 Rod Control System Circuitry Ground Faults

On November 13, 1993, the licensee was performing Surveillance Test Procedure OP-ST-CEA-002, "Functional Test of Secondary Control Element Assembly Position Indication System (SCEAPIS) Rod Block Actuations," when Group A Shutdown Rod 31 inadvertently withdrew to the full out position. The control room operator did not identify the rod withdrawal motion until the rod was fully withdrawn. The operator manually inserted the rod and the reactor was tripped. This was done to remove power from the control rod drive mechanisms to prevent inadvertent rod movement until the cause of this event was determined.

On November 15, 1993, while the licensee was performing Surveillance Test Procedure OP-ST-CEA-002, "Functional Test of SCEAPIS Rod Block Actuations," Rod 18 (one of four nontrippable rods) continued to insert when the operator released the withdrawal switch. Rod 18 was 2 inches from the bottom when the unexpected rod movement occurred.

An NRC Augmented Inspection Team was initiated to review the cause for these events and the adequacy of the licensee's response. The results of the Augmented Inspection Team was documented in NRC Inspection Report 50-285/93-25.

Conclusions

The control room operators responded in a conservative manner to the indicated inadvertent dilution event. Licensee management demonstrated a heightened concern for personnel safety and appropriately reviewed the cause for the nuclear instrumentation response.

3 OPERATIONAL SAFETY VERIFICATION (71707)

3.1 Routine Control Room Observations

The inspectors observed operational activities throughout this inspection period to verify that proper control room staffing and control room

professionalism were maintained. Shift turnover meetings were conducted in a manner that provided for proper communication of plant status from one shift to the other. Shift supervisors interviewed during this inspection period were found to be well informed of outage activities that had the potential of affecting plant operations. Discussions with operators indicated that they were aware of plant and equipment status and reasons for lit annunciators. The inspectors observed that Technical Specification limiting conditions for operation were properly documented and tracked. Plant management was observed in the control room on a daily basis. Licensed operators were found to make the appropriate announcements when they planned to go behind the control room panels, and the inspectors noted that they waited for the appropriate acknowledgements from the other licensed operators before proceeding.

The licensee had implemented effective measures to reduce potential distractions within the control room. Personnel access to the control room was limited to those individuals requiring access for work activities. Although personnel needing access to the control room was greater during the outage than when the plant was at power, the recently installed supplemental control room entrance provided a means for the operators to interface with maintenance personnel away from the at-the-controls-area.

3.2 Plant Tours

The inspectors routinely toured various areas of the plant to assess the safety conditions and adequacy of plant equipment. The inspectors verified that various valve and switch positions were correct for the current plant conditions. Personnel were observed obeying rules for escort of visitors and entry and exit into and out of vital areas.

3.2.1 Personnel Safety

Overall, permanent plant personnel adhered to established personnel safety procedure guidelines; however, the inspectors noted three separate instances where licensee contract personnel were not conducting activities in accordance with the safety procedures. These three instances involved an inadequate control of loads within the auxiliary building and improper use of safety harnesses around the refueling water cavity. The inspectors questioned each of the individuals involved and determined that, in each case, the individuals were cognizant of the safety requirements. One of the reasons identified by the contract workers for not adhering to the safety requirements was that they were trying to meet the refueling outage schedule. In addition, it was noted that permanent plant personnel had been in each of the areas, but these individuals had not challenged the contractors on the observed work practices.

On all three instances the inspector contacted the plant safety coordinator on shift and apprised him of the findings. On the day following each of these observations, the safety coordinators counselled all the maintenance crews at the beginning of their shifts. The safety coordinators instructed the personnel on the proper use of harness equipment and the proper method for lifting loads. In addition, the safety coordinator stressed the licensee

management's position that personnel safety should not be sacrificed to meet the refueling outage schedule. The inspector noted that the errors identified above were performed by temporary contract personnel hired specifically to work during the refueling outage. The inspector discussed this with the safety coordinator and he agreed that temporary workers may not be as familiar with the importance the licensee places on personnel safety. As a result, the safety coordinator stated that he would discuss with plant management possible methods that could be used during this outage and, in future outages, to better educate temporary workers on the licensee's safety policy. In the interim, the safety coordinator stated that, during his tours, increased vigilance would be placed on temporary employees.

3.2.2 Rigid Snubber for Pressurizer Code Safety Valve

While touring the containment building, the inspector noted that one of the four snubbers attached to the piping for the pressurizer code safety relief valves was found to be rigid, while the other three were found to have a certain degree of movement around their axis. This finding was discussed with the licensee. As the result of this discussion, the licensee investigated this condition and determined that the flat sections at both ends of the snubber, which are used for mooring purposes, contain a bushing collar. These collars rotate to a certain degree to facilitate installation of the snubber (i.e., in case the snubber and its mooring are not exactly perpendicular to each other). The licensee stated that this degree of play is limited to allowing a maximum of 6 degrees off the perpendicular, in any direction. The licensee also stated that the snubber in question was at the maximum degree of play, thus causing its rigidity. The inspector questioned the licensee as to whether having the snubber 6 degrees off the perpendicular would affect the performance of the snubber. The licensee stated that the snubber was operable and that it would remain operable throughout it's thermal growth pattern during heatup to normal temperature and pressure. The inspectors concluded that the licensee had appropriately considered snubber operability for the different plant conditions.

3.2.3 Housekeeping

Plant housekeeping and overall material condition of the plant was observed to be very good throughout the refueling outage. The licensee had generally provided for the prompt cleanup of equipment and removal of excess materials after each activity was completed. At the end of the inspection period, a slight decline was noted in the timeliness of returning work areas to their initial condition. This was particularly evident in the radiologically controlled area. The licensee identified that this was due to the large number of work activities being completed and the reduction in temporary personnel at the end of the outage. The inspectors noted that the slight decline in housekeeping activities had not adversely impacted plant operations.

3.3 Security Program Observations

Security personnel were found to perform their duties in a professional manner. Security personnel posted in both the primary and secondary access points were found to properly monitor plant and contract personnel entering through the detection equipment. Security personnel were also found to perform thorough inspections of personnel who failed to clear the detection equipment. The inspector observed security personnel perform package and vehicle searches. It was also observed that the security personnel involved in inspecting vehicles with radiological shipments had the appropriate dosimetry and had met the established radiation work permit requirements.

Vehicles were properly controlled or escorted within the protected area. Designated vehicles parked and unattended within the protected area were found to be locked and the keys removed. The inspectors routinely toured the protected area perimeter and found it maintained at an excellent level. Proper compensatory measures were implemented for a degraded security barrier.

On October 19, 1993, a security officer, posted at the auxiliary building personnel access point to the containment building, inadvertently provided a temporary contract employee with the incorrect security badge. The contract employee who had been working in the containment building was given the badge which belonged to a permanent plant employee. Both the contract employee and the security officer demonstrated poor self-verification techniques by having provided and accepted the incorrect badge.

The contract employee noted the error after he had exited the area and had returned to his work station in the upper electrical penetration room. The contract employee promptly notified his supervisor who subsequently contacted security. A security officer was promptly dispatched to the location of the contract employee and escorted him offsite. Security personnel verified that the employee, to whom the badge belonged, was still located in the containment building. A review of the security door logs verified that the contract employee had only been in areas where he had authorized access. The inspectors noted that all personnel with unescorted access in the protected area had the required clearance authorization to enter the vital areas. However, personnel access was restricted using administrative controls.

The inspectors assessed the safeguards significance as minor; however, the event did demonstrate poor self verification techniques by both the security officer and the contract employee. The licensee's corrective actions were found to be appropriate. The contract employee was instructed on the need to verify that the badge being handed to him is his own. The security officer in question was removed from his post and retrained on the proper procedure for handing out security badges. All security officers upon beginning their shifts were apprised as to the details of the event described above. They were instructed on the need to use the same procedure for handing out badges that is practiced at the primary and secondary access points. In addition, all security officers were required to refamiliarize themselves with the proper procedure for dispensing security badges. Security management was

reviewing other options to prevent recurrence of this event, including improved training. Subsequent tours of the auxiliary building by the inspectors confirmed that the security officers, posted at the entrance to the containment building, were properly verifying that the badges that were being returned were the correct ones.

3.4 Radiological Protection Program Observations

During this inspection period, the inspectors verified that selected activities of the licensee's radiological protection program were properly implemented. Health physics personnel were observed routinely touring the radiologically controlled areas. Contaminated areas and high radiation areas were properly posted, and restricted high radiation areas were found to be locked, as required. Area surveys, posted outside each room in the auxiliary building, were found to be current as noted by the posting date. These survey readings were found to be similar, with readings obtained by the inspector with the use of the NRC's survey meter. Also, with the use of the NRC's survey meter, the inspector verified the relative accuracy of listed readings on bags containing contaminated trash and/or equipment.

Good radiation work practices were noted throughout most of this inspection period, with a few minor exceptions. On two occasions the inspector observed temporary contract personnel remove their protective eyeware, while in the containment building, placing them down on a potentially contaminated surface, and then replacing them on their face. The inspector questioned the contract personnel as to whether they considered this to be a prudent action. Both agreed that it was contrary to good radiation work practices and the individuals subsequently reviewed the event with health physics technicians. It was noted that detectable contamination had been transferred to their faces. Another instance of poor radiation work practices was noted when, on three separate occasions, personnel exiting a contaminated area had thrown contaminated trash (duct tape) into the contaminated trash bag from a distance, basketball style. This provided the potential for the dispersal of air borne contamination when the tape landed in the bag or the trash missed the bag and landed in a clean area. The inspectors discussed these observations with health physics personnel who agreed that this was a poor practice and not acceptable.

During the review of maintenance and surveillance activities, the inspectors noted that the health physics technicians had provided excellent coverage. The technicians periodically surveyed the work areas and appropriately identified the best places to stand so as to get the least amount of radiation exposure. This contributed significantly to licensee personnel maintaining their radiation exposure ALARA.

Actions taken by the licensee in response to previous radiation work permit violations were found to be effective. One action taken by the licensee was to restrict the number of individuals that could be at the health physics window for routine briefs before entering the controlled area. The inspectors observed that this reduced the confusion at the access point. In addit ,

the individuals logging personnel into the controlled area instructed personnel to verify that their self-reading dosimeter was on. As a further verification, an individual was stationed at the immediate entrance to the radiologically controlled entry point to again verify proper dosimetry.

3.5 Stainless Steel Debris Found in Lower Core Support Plate

On October 24, 1993, during a visual inspection of the lower core support plate with the reactor core off loaded, the licensee identified a small piece of metal wedged in one of the flow holes. The metal wedge was estimated to be about 2 inches by 4 inches and 1/4-inch in thickness. The metal wedge was determined to be stainless steel and had been in the vessel during the previous operating cycle as determined by the 800 R/hr on contact reading. The licensee performed a complete inspection of the reactor vessel interior and reviewed possible locations or work activities which could have resulted in the debris being generated. The licensee eliminated the reactor coolant system or connected systems as the source. The licensee's review did not identify the source of the debris. It was determined that the debris had a negligible effect on the fuel and the vessel interior.

3.6 Spent Fuel Pool Cooling - Normal Alignment

The inspector verified, on November 2, 1993, the system valve alignment for the spent fuel pool cooling system, using Operating Instruction OI-SFP-1, "Spent Fuel Pool Cooling - Normal Operation," Checklist OI-SFP-1-CL-B. In addition, the inspector used Piping and Instrumentation Diagram 11405-M-11 to walk down the system. The inspector observed that all the accessible valves were in the correct position.

3.7 Conclusions

Operations personnel performance during routine activities was very good. The licensee was very effective in reducing potential distractions within the main control room.

Accessible valves within the spent fuel pool systems were properly aligned.

Instances of temporary contract personnel failing to adhere to licensee occupational safety and radiation work practices may indicate the need for improved training and better licensee oversight in this area. The lack of attention to detail displayed by a security officer resulted in issuance of a badge to the wrong person exiting the containment building. Security personnel response to this event was found to be good. Health physics coverage throughout the outage was found to be good. Radiation protection personnel aided plant personnel in maintaining very good ALARA practices.

4 MAINTENANCE OBSERVATIONS (62703)

4.1 Component Cooling Water Surge Tank AC-2, Nitrogen Vent Header Control Valve PCV-2839 Test

On October 20, 1993, the inspector observed the maintenance activity that was performed to remove, test, repair, and reinstall Component Cooling Water Surge Tank AC-2, Nitrogen Vent Header Pressure Control Valve PCV-2839. This work activity was governed by Preventive Maintenance Order 9306344 and Preventive Maintenance Procedure PE-PM-VX-3001, "Critical Quality Element Relief Valve Setpoint and Leakage Test." The inspector verified that the maintenance work order and procedure had been reviewed and approved, as noted by the appropriate signatures. In addition, the work package was found to contain the appropriate valve information as described in the vendor's specification sheet.

Preplanning efforts by the licensee prior to the initiation of this maintenance activity was very good. Briefings held per the requirements of Standing Order G-92, "Conduct of Infrequently Performed Procedures," were detailed in nature. During these briefings, detailed discussions of goals and concerns were held. The main concern was the fact that, during this maintenance activity, the component cooling water system would have to be taken out of operation. The reactor core had been totally offloaded to the spent fuel pool at the beginning of the refueling outage. Operations personnel estimated, conservatively, a 5°F/hour heat-up rate once component cooling water to the spent fuel pool cooling heat exchanger was stopped. The operators determined that, prior to shutting down the component cooling water system, efforts should be made to reduce the spent fuel pool temperature to 70°F, thus allowing as much time as possible for the effort. Based on this, the licensee determined that the amount of time it would take for the spent fuel pool temperature to reach the Technical Specification limit of 120°F would be 9 hours. To minimize the time for which the component cooling water system would be out of service, it was planned that the valve would be removed and replaced temporarily with a blank flange. This would allow the component cooling water system to be returned to service while the valve was being inspected and tested (a relief valve was still in place to provide overpressure protection for the surge tank). This maintenance activity was completed within the scheduled 3 hours.

4.2 Repair of Valve HCV-386

On November 1, 1993, the inspector observed a portion of maintenance activities on Valve HCV-386 which needed repairs due to failing a leak rate test. The work was performed using Maintenance Work Order 932014 and Procedure PE-RR-VX-0413S, "Inspection and Repair of Safety Related Fisher "HS" Control Valves." The work was performed in the radiologically controlled area and was designated as a contaminated area using Radiation Work Permit 1252. This valve is on the recirculation line to the safety injection and refueling water tank and must close upon the initiation of a recirculation actuation signal. The inspector observed maintenance personnel crack open the valve

flange in order to allow borated water remaining in the section of pipe to drain. The licensee showed good preplanning in that a catch basin was installed which drained to the auxiliary building sump. A dam was installed around the floor drain to contain water. The inspector noted that, without the dam, water would have spread over a large area of the auxiliary building floor. After the pipe was adequately drained, the licensee removed the valve to inspect for the cause of the leakage. The inspector observed that maintenance personnel performed their job in an excellent manner in accordance with the procedure and that personnel complied with their radiation work permit. A health physics technician was observed periodically monitoring the activities. The inspector interviewed the maintenance personnel and the quality control inspector assigned to the job. Both were knowledgeable of their duties. The inspector verified that the tools used were within their calibration period.

The inspector reviewed the maintenance history on Valve HCV-386 and its redundant isolation valve (HCV-385) and found nothing to indicate an adverse trend for these valves.

4.3 Removal of Loop Seal for Power Operated Relief Valves

On November 4, 1993, the inspector observed the licensee perform a portion of the removal of the loop seal on the inlet side of the power operated relief valves. The removal of the loop seal consisted of installing a drain line which would return coolant to the pressurizer. The activity was performed using Construction Work Order 930230. A quality control inspector was observing this portion of the maintenance and was very knowledgeable of his responsibilities and the nature of the work performed. The work was performed very well and no discrepancies were identified.

4.4 Reinstallation of Power Operated Relief Valves PCV-102-1 and PCV-102-2

On November 5, 1993, the inspector observed a portion of the reinstallation of both power operated relief valves (PCV-102-1 and PCV-102-2). These valves had been sent off site for testing and main disc and pilot disc spring replacements. The work was performed under Maintenance Work Orders 920043 and 920044, respectively. Procedure PE-RR-RC-0402, "Inspection and Repair of Pressurizer Power Operated Relief Valves," provided the instructions for the work. The inspector observed good adherence to the procedure and good communication between the craft and the quality control inspector. The inspector verified that the tools used were within their calibration period.

4.5 Troubleshooting of 125 Vdc/125 Vac Static Inverter B (EE-8J)

On November 16, the inspector observed portions of the licensee's troubleshooting efforts on the 125 Vdc/125 Vac Static Inverter B (EE-8J). This effort was being performed under Maintenance Work Order 933097. The purpose for the troubleshooting effort was to determine the reason the inverter failed the 125 percent overload test. The inspector reviewed the maintenance work order, its associated Preventive Maintenance

Procedure EM-PM-EX-0800, "Instrument Inverter Inspection," and the vendor's troubleshooting guide. The maintenance work order and the preventive maintenance procedure were found to have been reviewed and approved as noted by the appropriate signatures. In addition, all the documents provided sufficient information to identify the equipment to be worked on and detailed guidance to perform the effort.

The inspector observed that the inverter was tagged out of service, and power to the cabinet had been removed. Static Inverter A was verified to be in operation during this effort. The inspector questioned the technicians and noted that one was qualified for this effort, while the other was receiving on-the-job training for his qualification. Both were found to be knowledgeable of their responsibilities. Excellent procedural compliance was noted during this effort.

The inspector reviewed the training records of the technicians involved and no discrepancies were noted.

4.6 Replacement of Electrical Cable to Control Rod 31 Drive Package

On November 17, 1993, the inspector observed the removal and replacement of a new multiconductor cable to the Control Rod 31 drive package. The cable was replaced due to a broken insulator that separated the pins within the connector. The broken insulator was discovered during troubleshooting activities to locate the source of an electrical ground on the control rod drive system. The work was performed using Maintenance Work Order 933489.

The inspector observed maintenance personnel properly identify the cable to be replaced. The connector was observed to be properly aligned and care was taken to ensure a tight connection.

4.7 Conclusions

Maintenance activities were performed in a very good manner with adherence to procedures. Quality control personnel involvement and knowledge were found to be good. Briefings held prior to initiating complex activities were found to be excellent. Good cooperation between operations and other licensee groups was also noted.

5 SURVEILLANCE OBSERVATIONS (61726)

5.1 Safety Injection Refueling Water Tank Backleakage Test

On October 28, 1993, the inspector monitored the licensee's efforts during the performance of a surveillance test on the valves associated with the safety injection refueling water tank. The purpose of the test was to determine the amount of backleakage to the tank that would be experienced following a recirculation actuation signal. This effort was performed under Surveillance Procedure SE-ST-SI-3005, "Measurement of Post RAS Leakage Tests to the Safety

Injection Refueling Water Tank." The inspector verified that the procedure had been reviewed and approved, as noted by the appropriate signatures.

The inspectors questioned the licensee personnel and found them to be very knowledgeable with respect to the purpose of the test and their responsibilities during the performance of the test. The inspector noted that the pressure gauges, that were used to monitor the pressure applied to the valves being tested, had valid calibration stickers. The inspector also reviewed the calibration documentation for the pressure gauges. No problems were noted.

The inspector reviewed the licensee's final results. No discrepancies were noted. The final results were found to meet the acceptance criteria set forth in the surveillance procedure.

5.2 Engineered Safeguard Features Actuation Test

On October 29, 1993, the inspectors observed the licensee perform portions of Surveillance Test Procedure OP-ST-ESF-0011, "Channel "A" and "B" Automatic and Manual Engineered Safeguard Actuation Signal Test." This test is performed during each refueling outage to satisfy the Technical Specification requirements for testing initiation of automatic engineered safeguards, manual safety injection, manual containment spray, and manual containment isolation.

The inspectors reviewed Surveillance Test Procedure OP-ST-ESF-0011. The procedure was found to be prescriptive in nature. Numerous NOTES and CAUTION statements throughout the procedure provided excellent reminders and warnings as to what the licensee personnel should expect when a certain step of the procedure is performed. The procedural steps were found to be clear and easy to follow.

Performance of this surveillance test required the interaction of several licensee groups. These included operations, system engineering, and instrumentation and controls. This also was a test that was complex and infrequently performed. As a result, the licensee held a required prebriefing, per Standing Order G-92, "Conduct of Infrequently Performed Procedures." The inspector observed the prebriefing and found it to be detailed in nature. Attendance by all applicable groups, including operations management, was noted. Test goals were covered, as well as areas of concern. One such area dealt with the fact that, for a portion of the test, the shutdown cooling system would be isolated. The operators discussed the amount of time it would take to experience boiling in the reactor coolant system (conservatively estimated at 30 hours), and how long shutdown cooling would be isolated (conservatively estimated at 3 hours). Based on discussions during this meeting it was determined that, at any time the licensed operators felt uncomfortable with plant conditions, they had the authority to abort the test. Operations personnel also pointed out that the procedure did not address the fact that local verification of reactor coolant system temperature would be necessary. This was due to the fact that no control room indication of

reactor coolant temperature would be available once shutdown cooling was isolated. As a result, provisions were made to address this concern.

During the performance of the test, procedural compliance by the personnel involved was noted. Licensed operators were found to double-verify the instrumentation that they were to manipulate prior to performing a procedural step. Control room traffic was maintained at a minimum. Only personnel involved in the test were allowed to enter. The inspectors observed the performance of the different personnel involved in the test. Interaction between all groups involved in the surveillance was found to be excellent.

5.3 Containment Integrated Leak Rate Test (CILRT)

Between November 9 and 12, 1993, the inspectors observed portions of the licensee's integrated leak rate test. The purpose of this test was to measure the containment building leakage rate after it had been pressurized to 60 psig. The inspectors questioned the licensee and contract personnel responsible for running this surveillance test. They were found to be technically knowledgeable and had a very good understanding as to their responsibilities with regard to this test. The inspectors reviewed Surveillance Test Procedures SS-ST-ILRT-0001, "Containment Integrated Leak Rate Test (ILRT)," and SS-ST-ILRT-0006, "Operations ILRT Preparation and Recovery." Both were found to be technically adequate and had been reviewed and approved as noted by the appropriate signatures. The test was also found to satisfy the requirements of the Technical Specifications.

The inspectors compared the valve lineup, as described in Procedure SS-ST-ILRT-0006, against a sample selection of the piping and instrumentation diagrams of individual containment building penetrations, the chemical and volume control system, and auxiliary feedwater system. This was done in an effort to determine that all the appropriate valves in the selected systems were addressed in the procedure. The inspectors also reviewed the test position of the valves, listed in the same procedure, to verify that the associated systems were placed in correct alignment for the performance of the CILRT.

The inspector performed tours of the containment building to verify the installation of the test equipment and the valve lineup process. The inspector observed approximately 10 percent of the valves that had been positioned for the test. The licensee's independent valve verification process was found to be good and no errors or discrepancies were noted.

The personnel airlock to the containment building was closed, and the initiation of the containment pressurization began on November 9. On November 10, the minimum test pressure of 60 psig was reached and, at 11 p.m., the licensee met the stabilization criteria as described in Procedure SS-ST-ILRT-0001. The licensee, at this time, began taking test data every 15 minutes, marking the official start of the CILRT.

The licensee performed the 24-hour, Type A, Total Time Test, which was one of the options provided by Procedure SS-ST-ILRT-0001. The CILRT was completed on November 11 and, based on the preliminary data, no leakage was detected that exceeded the .75La limit established in Appendix J to 10 CFR Part 50.

5.4 Conclusions

Surveillance activities during this inspection period were found to be performed in an excellent manner with very good procedural compliance. Procedures were found to be detailed and easy to read, with the personnel involved in each effort displaying very good knowledge of their responsibilities. Prejob briefings were very informative and were found to provide an excellent forum for discussion of last minute details. Good control of control room traffic reduced operator distractions during a complex surveillance.

6 REFUELING ACTIVITIES (60710)

During this inspection period, the inspectors monitored portions of the licensee's refueling activities. The inspectors observed the licensed operators remove fuel from the fuel transfer canal upender and insert the fuel bundles into the reactor vessel with the use of Fuel Handling Machine FH-1. In addition, the inspectors interviewed several operators and found them to be knowledgeable of their responsibilities. Finally, the inspectors reviewed training records and verified that the operators interviewed had received the appropriate training and were qualified in the operation of the fuel handling machine.

The inspector also reviewed the licensee's final core installation inspection, which the licensee had performed with video cameras and which had been recorded. No discrepancies were noted.

The inspector toured the refueling pool deck area and identified that no extraneous material was stored within the foreign materials exclusion (FME) area. The inspector observed the FME coordinators maintaining accurate logs of material entering and exiting the FME area. In addition, the inspector observed FME coordinators touring the area, removing any items from the area that were left unattended, and verifying that they had been properly logged in prior to logging them out.

On October 27, 1993, while observing refueling activities, the inspector was informed by two FME area coordinators that they observed the presence of unknown material at the bottom of the refueling cavity. The inspector viewed the area of the refueling cavity to which the FME coordinators were referring to. The inspector noted the presence of several dark particles varying in size (approximately 2-6 inches, thickness was unknown) and location. Some were located 10 or more feet from the reactor vessel cavity. Other particles were in closer proximity, with one particle within 1 foot of the reactor vessel flange area. The FME coordinators stated that, at first, they had noted only one or two particles but that, as time went on, more particles

seemed to appear. They reviewed the FME log for the refueling pool and determined that the material observed in the refueling pool was not originating from any of the equipment that had been logged into the area.

The FME coordinators stated that they had shared their observations with the operators, but said that the operators did not appear to be concerned. The inspector questioned the operators on the fuel handling machine as to their awareness of the particles observed in the refueling pool. The operators indicated that they had observed the particles that the FME coordinators were referring to and that they considered the particles to be far enough away from the reactor vessel cavity. The operators also indicated that they did not know what the particles were or where they originated. When the inspector informed the operators of the presence of particles at the edge of the reactor vessel cavity and stated that the particles appeared to migrate with the currents caused by the operation of the fuel handling machine, the operators halted fuel movement activities.

The licensee, with the use of underwater cameras, identified the particles as very thin layers of rust. After reviewing all possible sources of this rust, the licensee determined that these particles came from the reactor coolant system piping. The piping contains a small layer of rust, which provides a natural protective coating to the piping inner surface. The licensee believed that, when the refueling pool was being refilled following activities where the reactor coolant system had been drained to midloop conditions, the rust dislodged. These particles were then forced up from the reactor coolant system into the refueling pool area where they settled. Apparently these particles were not identified earlier due to initial poor clarity of the water when the refueling activities began. After water clarity improved the particles became visible. The licensee determined that the particles posed no safety concern either due to their size (particles disintegrated on contact) or their chemical content.

The inspector noted that operations personnel did not display a more questioning attitude as to the source of the particles. Even though the originally identified particles were sufficiently distant from the reactor vessel cavity, the lack of knowledge as to their source and their impact should have raised concern with regard to these particles inadvertently entering the reactor coolant system. It appeared that licensee action was initiated after the inspector raised the concern.

Conclusions

The licensee's overall refueling effort was found to be good, with good procedural compliance. Operator knowledge of their responsibilities during the effort was found to be very good. A lack of a questioning attitude by the operators with regard to unidentified particles in the refueling pool was found to be a performance weakness. The inspector found that the diligence demonstrated by the FME coordinators throughout the refueling activities was excellent. Overall, the FME program that the licensee instituted for this refueling outage was very good.

ATTACHMENT

1 PERSONS CONTACTED

1.1 Licensee Personnel

*R. Andrews, Division Manager, Nuclear Services
*G. Cavanaugh, Licensing Engineer
*J. Chase, Manager, Fort Calhoun Station
G. Cook, Supervisor, Station Licensing
*S. Gambhir, Division Manager, Production Engineering
*J. Gasper, Manager, Training
*J. Herman, Acting Manager, Nuclear Licensing and Industry Affairs
*R. Jaworski, Manager, Station Engineering
*W. Orr, Manager, Quality Assurance and Quality Control
*T. Patterson, Division Manager, Nuclear Operations
*R. Phelps, Manager, Design Engineering
*D. Ritter, Supervisor, Nuclear Security Operations
*J. Sefick, Manager, Security Services
R. Short, Shift Outage Manager
J. Tills, Operations Supervisor

*Denotes personnel that attended the exit meeting. In addition to the personnel listed above, the inspectors contacted other personnel during this inspection period.

2 EXIT MEETING

An exit meeting was conducted on November 24, 1993. During this meeting, the inspector reviewed the scope and findings of the report. The licensee agreed with the inspection findings presented at the meeting. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.