ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	50-285
License No.:	DPR-40
Report No.:	50-285/99-13
Licensee:	Omaha Public Power District
Facility:	Fort Calhoun Station
Location:	Fort Calhoun Station FC-2-4 Adm. P.O. Box 399, Hwy. 75 - North of Fort Calhoun Fort Calhoun, Nebraska
Dates:	October 3, 1999 through November 13, 1999
Inspectors:	W. Walker, Senior Resident Inspector V. Gaddy, Resident Inspector D. Corporandy, Resident Inspector J. Moorman, Senior Resident Inspector D. Carter, Resident Inspector W. Maier, Senior Emergency Preparedness Analyst
Approved By:	Charles S. Marschall, Chief, Project Branch C

ATTACHMENT: Supplemental Information

SUMMARY OF FINDINGS

Fort Calhoun Nuclear Station
NRC Inspection Report 50-298/99-13 (DRP)

The report covers a 6-week period of resident inspection.

The body of the report is organized under the broad categories of Reactor Safety, and other activities as listed in the summaries below.

Inspection findings are assessed according to their potential risk significance and are assigned colors of green, white, or yellow. Green findings are indicative of issues that, while they may not be desirable, represent little or no risk to safety. White findings indicate issues with some increased risk to safety, which may require additional inspection resources. Yellow findings are more serious issues with higher potential risk to safe performance. The findings are considered in total with other inspection findings and performance indicators to determine overall plant performance.

Cornerstone: Initiating Events

- Green. During the refueling outage, the vital buses lost power for 2 minutes as operators transferred station lighting from 4160 volt Vital Bus 1A3 to Vital Bus 1A4.

  The NRC staff determined that this event had low risk significance because, using conservative assumptions, operators had a recovery time in excess of 10 hours before boiling around the core would occur. This gave operators sufficient time to start the emergency diesel generators and place shutdown cooling in service. In addition, the actual loss of power lasted 2 minutes, and reactor coolant and spent fuel pool temperatures remained unchanged during this period (Section R20.2).

Cornerstone: Mitigating Systems

- Green. An operator failed to properly align the upper spent fuel pool cooling suction valve. The resultant loss of cooling had only minor consequences.

  The issue was characterized as having low safety significance. Operators monitoring plant conditions identified the problem and reestablished spent fuel pool cooling in a timely manner. As a result, no increase in radiation levels and only a slight increase in spent fuel pool temperature (4°F) resulted. This violation is being treated as a noncited violation consistent with the interim enforcement policy for pilot plants (50-285/9913-01) (Section R20.3).

Report Details

Summary of Plant Status

The Fort Calhoun Station was in its 18th refueling outage during this inspection period. Several of the major activities completed during this outage included epoxy coating of the main condenser tube-to-tube sheet interface and repair of component cooling water isolation valves and feedwater heaters.

On November 11, 1999, the licensee closed the main generator output breaker to end Refueling Outage 18. The outage duration was 40 days.

1. REACTOR SAFETY
   Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness

1RO1 Adverse Weather Preparations

a. Inspection Scope

The inspectors performed a partial walkdown of systems exposed to cold weather conditions using Operating Instruction OI-EW-1, "Extreme Weather," Revision 3.

b. Observations and Findings

There were no findings identified.

1R12 Maintenance Rule Implementation

a. Inspection Scope

The inspectors verified proper implementation of the maintenance rule for Control Element Drive Mechanism RC-10-06 and Component Cooling Water Inlet Valve to Heat Exchanger AC-1C (HCV-491A).

b. Observations and Findings

There were no findings identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the operability evaluation associated with the following condition reports:

- CR 199901632, "Containment Air Cool/Filter Unit Carbon Filter, and
- CR 199902139, "Unfiltered Control Room In-leakage Design Basis.

b. Observations and Findings

There were no findings identified.

1R20 Refueling and Outage

.1 Review of Outage Plan

a. Inspection Scope

The Fort Calhoun Station refueling outage risk assessment was performed based on the 1999 refueling outage schedule, 1999 refueling outage modifications and facility changes, an outage risk assessment management profile, and insights from shutdown operations protection plan. The senior resident inspector, branch chief, and senior reactor analyst participated in the outage review meeting held onsite September 21, 1999.

The inspectors primarily focused on the following high risk activities:

- Transition and midloop operation,
- Fuel offload and placement in the spent fuel pool,
- Component cooling water and raw water outage,
- East raw water outage and fuel movement, and
- Planned refueling outage modifications.

b. Observations and Findings

There were no findings identified.

.2 Electrical Power

a. Inspection Scope

During the outage, the inspectors verified that the licensee maintained the proper number of electrical sources to satisfy Technical Specification and shutdown operations protection plan requirements. However, on October 26, 1999, at 1:32 a.m., Vital Buses 1A3 and 1A4 were de-energized for approximately 2 minutes. The plant was in Mode 5 with the reactor vessel head removed with approximately 30 feet of water above the reactor core. Operations personnel were performing an engineered safety features test when power to the vital buses was lost. Specifically, operators were transferring station lighting from 4160 volt Vital Bus 1A3 to Vital Bus 1A4 when power was lost. Corrective actions for this event are discussed under event followup in Section 4OA3 of the report.

b. Observations and Findings

Surveillance Test OP-ST-ESF-0002, "Diesel Generator No. 1 and No. 2 Auto Operation," required operators to use Operating Instruction OI-EE-5, "Station Lighting Bus and Transformer Operations," to transfer station lighting from Vital Bus 1A3 to Vital Bus 1A4. The plant was in Mode 5 with the reactor cavity flooded, shutdown cooling in operation, reactor coolant system temperature at approximately 103°F, and both diesel generators in OFF-AUTO as required for plant conditions.

During the lighting transfer, operators opened Station Lighting Feeder Breaker T1C-3A as required by procedure. When the breaker was opened, 161 kV Feeder Breakers 1A33 and 1A44 that supply power to the vital buses opened. Station Lighting Feeder Breaker T1A-4A also opened. Since the diesel generators were in OFF-AUTO they did not automatically start. Operators recognized both vital buses were de-energized and started both diesel generators which supplied power to the vital buses. Coincident with starting the diesel generators, operators also entered Abnormal Operating Procedure AOP-32, "Loss of 4160 or 480 Volt Bus Power." The vital buses were de-energized for approximately 2 minutes. With the vital buses de-energized, shutdown cooling and spent fuel pool cooling were lost. Reactor coolant and spent fuel pool temperatures remained unchanged at approximately 103°F and 82°F respectively, during the period the vital buses were de-energized.

At 1:59 a.m. operators aligned Vital Bus 1A3 to be supplied from 345 kV and at 2:09 a.m. Vital Bus 1A4 was aligned to 345 kV. Following this alignment, both diesel generators were shut down. All other equipment operated as expected during the loss of power to the vital buses.

The licensee performed troubleshooting to determine why the 161 kV feeder breakers opened while attempting to transfer station lighting. Troubleshooting identified that the loss of power to the vital buses was caused by the unplanned actuation of 161 kV Breaker Failure Relay 86X/FT161, which provided a trip signal to the feeder breakers for Vital Buses 1A3 and 1A4. The licensee determined that 161kV Breaker Failure Relay 86X/FT161 had a minimum pickup voltage of 73 volts. When Station Lighting Feeder Breaker T1C-3A was opened with both vital buses aligned to the 161 kV supply, a voltage spike in excess of 150 volts was measured. This was well above the 73 volts needed to actuate the relay. The inspectors noted that, as permitted by procedures for refueling outage conditions, operators had disabled the fast transfer of power to the vital buses. If an inadvertent actuation of the breaker failure relay had occurred during power operations, a fast transfer would have precluded a loss of power to the vital buses.

The NRC staff determined that this event had low risk significance because, using conservative assumptions, operators had a recovery time in excess of 10 hours before boiling around the core would occur. This gave operators sufficient time to start the emergency diesel generators and place shutdown cooling in service. In addition, the actual loss of power lasted 2 minutes, and reactor coolant and spent fuel pool temperatures remained unchanged during this period (Section R20.2). This resulted in a Green finding.

.3 Spent Fuel Cooling System Operation

a. Inspection Scope

The inspectors performed a review of the October 27, 1999, operations personnel error in properly shifting spent fuel pool cooling suction from the lower suction position to the upper suction position.

b. Observations and Findings

An operator failed to independently verify the valve position of Upper Spent Fuel Pool Cooling Suction Valve AC-186, causing a loss of spent fuel pool cooling. The loss of cooling had only minor consequences.

The inspector reviewed Condition Report 199902315 and noted that Upper Spent Fuel Pool Cooling Suction Valve AC-186 was misaligned during the transfer of spent fuel pool cooling from lower Spent Fuel Pool Cooling Suction Valve AC-187 to Upper Spent Fuel Pool Cooling Suction Valve AC-186. During discussions with the licensee, the inspectors were informed that the upper spent fuel pool cooling suction valve was a reverse acting valve and that the equipment operator assumed the valve was opening when it was actually being closed.

The suction source for the spent fuel pool cooling pump in service was isolated for approximately 1.5 hours. The spent fuel pool temperature increased approximately 4°F during the 1.5 hours the spent fuel pool cooling pump suction source was isolated. The valve misalignment was discovered by control room operators noting an upward trend in the spent fuel pool temperature.

The inspectors questioned the licensee concerning possible damage to the spent pool cooling pump. The licensee determined that, since the spent fuel pool cooling suction valves were butterfly valves, some leak-by occurred which would explain why the spent fuel pool cooling pump did not experience excessive heatup without a suction source. The licencee performed an oil change and vibration analysis on the spent fuel pool cooling pump and noted no problems.

During review of operating procedures, the inspector noted that Attachment 7 of Operating Instruction OI-SFP-1, "Spent Fuel Pool Cooling Normal Operation," Revision 13, required that when restoring spent fuel pool cooling to the upper suction source the Upper Suction Valve AC-186 be independently verified as open. Technical Specification 5.8.1 states, in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33. Regulatory Guide 1.33, Appendix A, Section 3.h, states these procedures are for properly operating fuel storage pool purification and cooling systems. Failing to properly align the spent fuel pool cooling system is a violation of Technical Specification 5.8.1.

The issue was characterized as having low safety significance. Operators monitoring plant conditions identified the problem and reestablished spent fuel pool cooling in a

timely manner. As a result, no increase in radiation levels and only a slight increase in spent fuel pool temperature (4°F) resulted. This violation is being treated as a noncited violation consistent with the interim enforcement policy for pilot plants (50-285/9913-01).

.4 Containment Closure

a. Inspection Scope

Using Standing Order SO-O-21, "Shutdown Operation Protection Plan," and the Technical Specifications, the inspectors verified that the licensee maintained containment closure as required by plant conditions.

b. Observations and Findings

There were no findings identified.

.5 Reduced Inventory and Midloop

a. Inspection Scope

The inspectors observed midloop activities to verify that the licensee had appropriately considered the risk associated with this activity. The inspectors reviewed the licensee's response to Generic Letter 88-17 and verified that licensee commitments had been properly translated into procedures. The inspectors also observed the quality of the pre-evolution briefing and verified that multiple sources of electrical power and multiple reactor vessel level and temperature indicators were available.

b. Observations and Findings

There were no findings identified.

.6 Refueling Activities

a. Inspection Scope

The inspectors observed both core off-load and core reload activities. Refueling was conducted using Operations Procedure OP-12, "Fueling Operations." All activities observed were performed in accordance with Technical Specifications and administrative procedures. The inspectors verified that fuel assemblies were adequately tracked.

b. Observations and Findings

No findings were identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors observed all of portions of the following surveillance tests:

- Surveillance Test Procedure OI-ST-10, "Turbine Tests," Revision 24, and
- Surveillance Test Procedure PE-ST-VX-3009, "ASME Section XI Code Relief Valve Test for the Safety Injection System," Revision 1.

b. Observations and Findings

There were no findings documented during this inspection.

1EP1 Drill, Exercise, and Actual Events

.1 Supplemental Inspection of White Performance Indicator Input

a. Inspection Scope

The region-based inspector performed supplemental inspection of the licensee's identification and resolution of drill and exercise performance area problems that caused that performance indicator to change from green to white. This inspection effort evaluated the adequacy of licensee efforts to identify and resolve the performance problems associated with the generation of erroneous protective action recommendations during the May 6, 1999, emergency preparedness drill.

The inspector reviewed the following documents:

- Condition reports dealing with protective action recommendation problems,
- A December 1998 emergency planning department self-assessment detailing dose-assessment and protective action recommendation problems,
- Condition reports documenting the performance problems which occurred during the May 6, 1999, emergency preparedness drill, and
- A root cause analysis report written about this performance issue.

The inspector interviewed the root cause analysis report authors and the Emergency Planning Department staff to determine the licensee's evaluation of the need for, and status of, corrective actions in this area. The inspector reviewed the short-term corrective actions completed, their effect on the value of the performance indicator, and the long-term corrective actions planned.

b. Observations and Findings

The inspector noted that this performance indicator crossed the threshold into the white band due to the monthly reporting of data. This requirement heavily weighted the most recent data. Poor performance in protective action recommendation development and transmission identified during the May 1999 emergency preparedness drill drove the indicator into the white band for the month, although the overall results for that quarter kept the value in the green band.

The inspector determined that the licensee's root cause analysis report contained a detailed description of the problem, how it was identified, and its significance. The report identified that a history of performance issues related to the problem had existed. These were primarily in the area of offsite dose assessment performance. The report did not specifically state how long these performance issues had existed. The report described that the problem was significant because, if the performance deficiencies had occurred during an actual event, the risk consequences could have been severe.

The inspector learned that the performance deficiencies noted in the May 6, 1999, drill were not immediately identified and critiqued by the controllers and evaluators present at the time. Rather, they were discovered by the licensee during a review of the drill data approximately a week after the drill. The failure of controllers to identify the problems caused the licensee to question the adequacy of its critique process. The licensee entered this problem into its corrective action system via Condition Report 199901272, Item W-6.

The root cause analysis was performed by using a causal factors analysis. Causal factors were developed for each of the human performance deficiencies. The report listed what it considered the root causes for the two most significant performance deficiencies observed during the drill and discussed contributing causes. The root cause for the dose assessment performance inadequacies was that clear roles and responsibilities for individuals involved in the direction, review, and notification of dose assessment reports had not been developed and practiced by emergency response organization personnel. The reported root cause for the incorrect protective action recommendations was inadequate verification practices by the emergency response personnel responsible for the review of the recommendations.

The inspector determined that the root cause conclusions listed by the licensee were actually apparent causes and did not point to one or more of the three traditional root causes for human performance deficiencies (inadequate procedures, training, or management oversight). However, the inspector noted that the licensee's report did discuss and make conclusions in the above three causal areas.

The inspector noted the root cause analysis was very focused on the specific event documented in the initiating condition report. The report stated that a review of condition reports for related issues had been done. The report's investigation of the extent of condition was limited in that it did not state whether drill records for previous drills and exercises had been checked for similar occurrences by other response teams. This was particularly important in light of the licensee's identification of critique

inadequacies. Although the investigation of the extent of the condition was limited, corrective actions were applied to all responders, not just to the team that had performed the drill. This practice adequately addressed the potential generic concerns with performance of other teams.

The licensee did perform a generic implications analysis as part of the root cause analysis and review of related condition reports. The analysis revealed a common cause: procedures were not properly maintained by emergency response organization users (lack of ownership).

The root cause analysis report listed both short-term corrective actions that had already been completed and recommendations for long-term corrective actions. The short-term corrective actions recommended by the report were:

- Meet with protective measures (dose-assessment) personnel to discuss lessons learned and reinforce expectations, and

- Meet with command and control responders to provide feedback from the root cause evaluation report and reinforce expectations.

The licensee took some additional short-term corrective actions beyond those recommended in the root cause report. These were:

- Revise emergency response practices to ensure that transfer of the protective measures (dose assessment) function accompanied transfer of the command and control function, and

- Provide training to command and control responders to discuss the above revision and to review procedural requirements in the risk significant functions of classification, notification, and protective action decision-making.

These corrective actions were appropriate and directly addressed the root causes. The adequacy of the corrective actions was verified during the NRC-evaluated biennial exercise. No dose assessment or protective action recommendation findings were identified. As a result, the performance indicator was restored to and remained in the green band for the last two quarters.

The inspector determined that a schedule had been established for implementing and completing long-term corrective actions; however, given the risk significance of the issue, the schedule for these actions appeared untimely. For example, the action plan of a process enhancement team chartered to address protective measures issues is not due until 7 months after the drill. Another process enhancement team, established prior to the drill has not actively pursued long-term process enhancements. These teams were tasked with long-term procedure and training enhancements that will not be pursued until the next calendar year.

The long-term corrective actions, although not finalized, directly addressed the causes of the performance issues identified in the root cause analysis report. The quantitative

measures of success of these corrective actions will be captured by the Drill and Exercise Performance indicator, which has remained green. The inspectors concluded that the level of degradation of this performance indicator was not substantial enough to pose a risk to public health and safety.

4. OTHER ACTIVITIES (OA)

4OA2 Performance Indicator Verification (71151)

a. Inspection Scope

The inspectors verified the accuracy and completeness of data used to calculate and report:

- The transients per 7000 critical hours,
- Safety system unavailability,
- Safety system functional failures, and
- The containment leakage performance indicators.

b. Observations and Findings

No findings were identified in the verification of these performance indicators. The performance indicators all remained in the licensee response band (Green).

4OA3 Event Followup

a. Inspection Followup

The inspectors reviewed the licensee's corrective actions following an October 26, 1999, loss of power to both Vital Buses 1A3 and 1A4.

b. Observations and Findings

The inspectors performed a review of the licensee's root cause analysis, "Loss of 4.1-kV Bus 1A3 and 1A4 Power During Station Lighting Transfer." Based on the inspector's review of the licensee's corrective actions, no additional NRC involvement is required.

4OA4 Other

.1 Review of Licensee Response to NRC Generic Letter 98-02, "Loss of Reactor Coolant Inventory and Associated Potential For Loss of Emergency Mitigation Functions While in a Shutdown Condition"

a. Inspection Scope

The inspectors reviewed Engineering Evaluation DEN-98-0279 dated November 24, 1998, written by the licensee in response to Generic Letter 98-02.

b. Observations and Findings

The evaluation concluded that the emergency core cooling system at FCS is not susceptible to common-mode failure similar to events described in the generic letter. As a result of the evaluation, the licensee did add an additional step to Procedure OI-SC-1, "Shutdown Cooling Initiation," to independently verify LPSI Pump Suction Valves HCV-2937 and HCV-2947 closed prior to initiating shutdown cooling. These valves isolate the low pressure safety injection pumps from the safety injection and refueling water tank suction header during shutdown cooling operations.

The inspectors reviewed the licensee's engineering evaluation using Temporary Instruction 2515/142, "Draindown During Shutdown and Common-Mode Failure (NRC Generic Letter 98-02)." The review addressed design features, such as a common pump suction header, which could render the emergency core cooling systems susceptible to common-cause failures. The inspectors determined that the licensee's engineering evaluation properly addressed the concerns of GL 98-02 and that FCS is not susceptible to the common-cause failure event similar to that detailed in the generic letter. No further inspection is required under Temporary Instruction 2515/142.

4OA5 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on November 15, 1999. The licensee acknowledged the findings presented. The licensee did not consider any material examined during the inspection proprietary.

ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

Licensee

M. Frans, Manager Nuclear Licensing
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ITEMS OPENED, CLOSED, AND DISCUSSED

OPEN AND CLOSED

50-285/9913-01	NCV	Failure to independently verify valve position of the Upper Spent Fuel Pool Suction Valve AC-186 (Section IR20).