APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-285/94-06

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: January 24-28, 1994

Inspectors: L. Smith, Senior Resident Inspector, Arkansas Nuclear One
J. Tapia, Reactor Engineer/Examiner, Region IV
R. Mullikin, Senior Resident Inspector, Fort Calhoun Station

Approved: L. Smith for Thomas P. Stetka, Chief, Project Branch D — 2/22/94 Date

Inspection Summary

Areas Inspected: This special, announced inspection reviewed four operational events and included a followup on previous inspection items.

Results:

- Inadequate control of licensed activities was identified during review of four events, which included an unplanned boron dilution of the reactor coolant system, the simultaneous inoperability of two auxiliary feedwater pumps, a failure to operate the control room ventilation system in the recirculation mode as required by the Technical Specifications, and an unmonitored withdrawal of a control element assembly (Sections 2, 3, and 4).

- Inadequate command and control were evident during the boron dilution event in that there was a failure to assign system operation oversight activities and a failure to conduct adequate briefings (Section 2.3).

- Operators failed to follow procedures in the boron dilution event and with regard to the operation of the control room ventilation system. These failures are an apparent violation of Technical

Specification 5.8.1 (285/9406-01 and 285/9406-05) (Sections 2.2 and 4.2).

- Procedural weaknesses were identified during review of the boron dilution event and the unmonitored withdrawal of a control element assembly (Sections 2.2 and 3).

- The failure to establish containment integrity when inadvertently moving two control element assemblies was an apparent violations of Technical Specification 2.6(1)d (285/9406-02) (Section 3).

- Operators failed to use all available indications to determine control element assembly position during trouble shooting activities. As a result, control element assembly withdrawal was unmonitored (Section 3).

- Simultaneous inoperability of two auxiliary feedwater pumps is an apparent violation of Technical Specification 2.5(1) (285/9406-04) (Section 4.1).

- Less than adequate procedures were identified with the operation of the control room ventilation system and the testing of the auxiliary feedwater pumps. These procedural inadequacies are apparent violations of Technical Specification 5.8.1 (285/9406-03 and 285/9406-06) (Sections 4.1 and 4.2).

- As a result of a review of the boron dilution and control room ventilation events, it was noted that a lack of detailed system knowledge for operations personnel contributed to the events (Sections 2.4, and 4.2).

Summary of Inspection Findings:

- Apparent Violation 258/9406-01 was opened (Section 2.2).

- Apparent Violation 258/9406-02 was opened (Section 3).

- Unresolved Item 285/9326-02 closed (Section 4.1).

- Apparent Violation 258/9406-03 was opened (Section 4.1).

- Apparent Violation 258/9406-04 was opened (Section 4.1).

- Unresolved Item 285/9326-03 closed (Section 4.2).

- Apparent Violation 258/9406-05 was opened (Section 4.2).

- Apparent Violation 258/9406-06 was opened (Section 4.2).
- Apparent Violation 258/9406-07 was opened (Section 4.2).

Attachment:

- Persons Contacted and Exit Meeting

DETAILS

1 INTRODUCTION

NRC monitors plant performance to provide for timely inspection of potential adverse performance trends. This reactive special inspection was performed because four events, which involved less than adequate control of licensed activities, occurred between November 13, 1993, and January 18, 1994.

1.1 Uncontrolled Withdrawal of Control Element Assembly (CEA)

On November 13, 1993, the FCS was in a refueling condition, Mode 5. During surveillance testing on the secondary CEA position indication system, electrical grounds caused CEA 31 to fully withdraw from the core. CEA movement was not detected by the operating staff until the CEA was fully withdrawn. An Augmented Inspection Team (AIT) was dispatched to the site, in accordance with NRC Inspection Manual 0325, to review the circumstances of the event. This inspection is documented in NRC Inspection Report 50-285/93-25. In order to provide for timely understanding of significant operational events at nuclear power plants, enforcement is not addressed by AITs. This special inspection was conducted, in part, to identify apparent violations of requirements related to this event. Relevant operator performance observations made by the AIT are also summarized in this report.

1.2 Auxiliary Feedwater Pump Inoperability

On December 9, 1993, both trains of the auxiliary feedwater system were rendered inoperable. This event was initially evaluated in NRC Inspection Report 50-285/93-26. Unresolved Item 285/9326-02 was issued in that report because further inspection was needed to assess the 10 CFR 50.59 evaluation and procedural change reviews performed by licensee personnel, and implementation of the command and control of licensed activities.

1.3 Mispositioning of Control Room Dampers

On December 30, 1993, one train of the control room ventilation system was not placed in the recirculation mode, as required by Technical Specification (TS) 2.22. This event was initially evaluated in NRC Inspection Report 50-285/93-26. Unresolved Item 285/9326-03 was initiated to further evaluate the cause(s) for the apparent failure of operations personnel to comply with TS requirements.

1.4 Unplanned Dilution of the Reactor Coolant System (RCS)

On January 18, 1994, reactor power exceeded 100 percent of full power for 1.5 hours as the result of an inadvertent dilution of the RCS boron concentration. An evaluation of this event was conducted to determine the adequacy of command and control of operational activities.

2 UNPLANNED DILUTION OF THE RCS

On January 13, 1994, at 3:20 p.m., reactor power exceeded the licensed reactor power limit of 1500 MWt, when power increased to 100.573 percent (1508.6 MWt) for 1.5 hours as a result of an inadvertent dilution of the RCS, which occurred while placing a chemical and volume control system (CVCS) ion exchanger in service. A review was conducted of the details that resulted in an unplanned increase in power and subsequent unplanned entry into a TS limiting condition for operation (LCO).

2.1 Background

In the course of normal preplanned work, CVCS Ion Exchanger CH-8A was filled with 20 cubic feet of lithiated, mixed-bed resin. The valve alignment from Operating Instruction OI-CH-10, "Saturating New Resin with Boron," was initiated. The night shift completed their assignment in accordance with Operating Instruction OI-CH-10 and turned over to the day shift. The oncoming shift supervisor, licensed senior operator (LSO), and nonlicensed equipment operator nuclear auxiliary (EONA) discussed the actions required for completion of Operating Instruction OI-CH-10. It was agreed that the EONA would take the lead for the completion of the boron soak of the resin, since all the required activities would occur in the auxiliary building. While the EONA was completing Operating Instruction OI-CH-10, the LSO and the two on-shift reactor operators (ROs) held informal discussions concerning the actions that would be required after the boron soak was completed. The subsequent actions included flushing the boric acid from the ion exchanger and diverting the effluent to the liquid waste system.

The LSO did not clearly delegate responsibility to the ROs regarding who would direct the upcoming evolution. In addition, the LSO did not reference Operating Instruction OI-CH-02, "CVCS Purification System Normal Operation," which was the procedure to be used for placing Ion Exchanger CH-8A in service. The LSO also failed to fully communicate specific system responses or operational concerns associated with placing a newly borated ion exchanger in service. One RO did elect to review the relevant procedure but did not obtain a copy for use during the evolution.

The 30-minute boric acid soak of Ion Exchanger CH-8A began at 2:05 p.m. This soak was performed to prevent the introduction of diluted rinse water into the RCS. This water entering the RCS would cause the boron concentration to decrease and result in an increase in reactor power. At 2:35 p.m., all of the other ion exchangers were bypassed so Ion Exchanger CH-8A could be placed in service following the soak. At 2:46 p.m., the ion exchangers were returned to service, with Ion Exchanger CH-8A already in service, and the letdown flow was directed to the waste system. Blending to the volume control tank (VCT) was also commenced to maintain the level in the pressurizer. At 2:56 p.m., following a 10 minute flush to remove the boric acid from Ion Exchanger CH-8A, letdown was again directed to bypass the ion exchangers. Ion Exchanger CH-8A was not valved out at this time, since it was assumed that the oncoming shift would continue the flush and would request the chemistry department sample the

ion exchanger effluent to determine the boron concentration. The RO performing the ion exchanger flush asked the LSO how long to flush the header to waste prior to realigning letdown flow to the VCT. The LSO directed the RO to flush the ion exchanger for 2 minutes. The RO elected to double the time, flushed the header to waste for 4 minutes, and then realigned the header to the VCT. The RO did not express his concern over the short flush time to the LSO, nor did he utilize Operating Instruction OI-CH-02. The operating instruction required, at Step 6.5.14, a header flush time of approximately 8-10 minutes to ensure that the diluted rinse water is not added to the RCS. This step was not implemented because the operators were not utilizing the operating instruction.

As a result of the 4 minute flush, not all of the approximately 200 gallons of diluted rinse water in the outlet header was flushed to the radioactive waste treatment system (RWTS). The oncoming shift assumed responsibility for operation of the facility at approximately 3:15 p.m., and 5 minutes later, the plant computer updated the calculated reactor thermal power. This calculated value exceeded the licensed power of 1500 MWt. Reactor power is normally maintained at 1498 MWt. The operators responded by blending 10 gallons of boric acid and 50 gallons of demineralized water to the VCT, which was injected into the RCS to reduce reactor power. The following information shows the trend in power and associated actions taken by the operators. The 8-hour thermal power average did not exceed 1500 MWt.

Time	Power, MWt	Action
3:30 p.m.	1505.18	Added 15 gallons of boric acid and 40 gallons of water to the RCS
3:40 p.m.	1506.53	
3:50 p.m.	1506.99	Added 10 gallons of boric acid and 30 gallons of water to the RCS
4:00 p.m.	1507.08	Added 15 gallons of boric acid and 30 gallons of water to the RCS and selected the other boric acid storage tank for suction
4:10 p.m.	1508.60	Added 15 gallons of boric acid and 30 gallons of water to the RCS
4:20 p.m.	1506.19	Entered TS LCO 2.10.4(5)(b) based on exceeding a departure from nucleate boiling related parameter
4:50 p.m.	1500.00	Exited TS LCO 2.10.4(5)(b)

2.2 Procedure

Step 6.5.12 of Operating Instruction OI-CH-2, "CVCS Purification System Normal Operation," required the operators to rinse Ion Exchanger CH-8A to the RWTS until the ion exchanger outlet boron concentration was equalized with the RCS boron concentration. This step was not completed in that the ion exchanger outlet boron concentration was less than the concentration in the RCS when the ion exchanger was placed in service. Step 6.5.13 involved the maintenance of the VCT level and was accomplished. Step 6.5.14 required that, when rinsing was completed, the ion exchanger bypass valve be placed in the bypass mode to divert the rinse water to the RWTS for 8-10 minutes, or as directed by the shift supervisor, to ensure that the diluted rinse water was not added to the RCS. This step was not accomplished in that diluted rinse water was added to the RCS.

Operating Instruction OI-CH-2 was designated as a continuous use procedure on each page of the procedure. Standing Order SO-O-1, Revision 17a, "Conduct of Operations," delineates management's expectations regarding procedure use and adherence for operational activities. Step 12.1.4 of Standing Order SO-O-1 required that procedures designated for continuous use: (1) be in the possession of the operators performing the activity, (2) have each step of the procedure read prior to the performance of that step of the activity, (3) be performed exactly as written in the sequence specified, and (4) have each step of the procedure signed off or checked as completed before proceeding to the next step. The failure to perform Steps 6.5.12, and 6.5.14 of Operating Instruction OI-CH-2, as required by Standing Order SO-O-1, is an apparent violation of TS 5.8.1 (285/9406-01).

Operating Instruction OI-CH-02 was reviewed for technical content and it was determined that the procedure was weak. The procedure did not include all the steps that were actually performed by the operations staff for preparing an ion exchanger prior to placing it in service. For example, one step in the procedure referred to the rinsing of the ion exchanger to the RWTS until the outlet boron concentration was equalized with the RCS. The step did not take into account the effect on the RCS due to a reduction in lithium, resulting from directing all of the rinse to the RWTS, nor did it minimize the generation of waste. To take these factors into account, the operators implemented a common practice of valving in an ion exchanger for additional rinsing and observing the effect on the RCS several times over a period of approximately 2-3 days after the initial rinse of the ion exchanger. This practice was not specifically proceduralized and it required operators to implement portions of the procedure several different times.

The procedure was also complicated because it could be used for two separate evolutions, which included placing an ion exchanger in service while maintaining constant RCS boron concentration, and deboration of the RCS using a new ion exchanger. Finally, the procedure directed that the flushing of the ion exchanger outlet header be accomplished for approximately 8-10 minutes, or as directed by the shift supervisor, to ensure that the diluted rinse water would not be added to the RCS. This step was not specific because it did not

provide guidance on what factors should be taken into account by the shift supervisor for specifying a different time of flushing.

2.3 Operating Crew Performance

Control room command and control was less than adequate in that the LSO did not ensure the adequacy of either the prejob briefing or the actual performance of the evolution. Communications were poor and procedural usage was limited. The LSO only provided general instructions to the ROs and did not assign responsibility for completing the evolution to a specific RO. The LSO's expectation was that the ROs would obtain the correct procedure and direct the evolution. Since the LSO did not specifically direct this to occur, the ROs did not believe that they were to take control of the evolution. Although the procedure for directing this evolution was available in the control room, the ROs did not utilize it to perform the evolution. The EONA was following the procedure and was the only person performing the required step-by-step sign offs. The failure of the ROs to utilize the procedure in directing the activity led to the prompting of the ROs by the EONA and had the effect of placing the EONA in the position of directing the ROs in the performance of control room activities. This failure to provide command and control was considered a weakness in the performance of the LSO.

A lack of an evaluation of shift staffing also may have potentially contributed to the event. The LSO had been off shift since January 11, 1993, and returned to shift status on the day of the event, January 18, 1994. To reactivate his license, the LSO was required to perform 40 hours of watchstanding in the control room under instruction from January 3-7, 1994. The LSO was also required by the licensee's program to perform a plant tour of all accessible areas and to be current on all necessary requalification requirements. Although these license reactivation requirements were adequate from a regulatory perspective, they were the minimum required for a quarter. The reactivation met the intent of regulations; however, the licensee stated that the reactivation was not evaluated to determine the need for additional training or watchstanding, as a result of having the LSO off shift for a period greater than 1 quarter.

An additional contributing factor in the poor performance of the operating crew was the decision to suspend the flushing operation without adequate communication to the oncoming crew. The flushing of the header was accomplished just prior to shift change and the effect of the unknown dilution was not identified until the oncoming crew was on shift. The failure to adequately consider the potentially negative impact of a change in operating shift crews during critical evolutions was considered a weakness.

The RO, who questioned the LSO about the required header flush time, failed to maintain an adequate questioning attitude when presented with information that he considered suspect. Instead, the RO elected to apply what he considered to be a conservative factor to the instructions received and did not communicate his action to the LSO. The RO's actions were indicative of self-checking and communication weaknesses.

2.4 Training

This event also raised a concern with the adequacy of the requalification training program. The shift supervisor, LSO, and ROs involved in this event received regularly scheduled requalification training on the CVCS 6 days prior to the occurrence of this RCS dilution incident. The lesson plan utilized during this requalification training was reviewed and was found to contain the basic elements of system operation and reference to previous dilution events, both at the Fort Calhoun Station and at other reactor sites. The requalification training did not include a review of applicable system operating instructions or their use and limitations. The short amount of time between the requalification training and the occurrence of the RCS dilution event raised concerns regarding the effectiveness and subsequent results of requalification training. Adequate review of previous events and a thorough understanding of system design could have alerted operators to the potential for RCS dilution problems and the need for heightened awareness.

2.5 Previous Experience

On September 25, 1984, Ion Exchanger CH-8A was placed in service and also resulted in a dilution of the RCS. While flushing the ion exchanger, reactor power increased to 1515 MWt and cold leg temperature rose above 545°F for approximately 1 hour. Operating Instruction OI-CH-02 was revised on September 11, 1984, to require flushing of the ion exchanger for 5 minutes prior to placing it in service in order to prevent a dilution event.

On July 11, 1990, while rinsing Ion Exchanger CH-8A, an unexpected amount of diluted water was added to the RCS and cold leg temperature increased from 539.5 to 540.3°F. This event resulted because the requirement for a 5 minute flush prior to placing the ion exchanger in service was left out in a previous procedure revision. The procedure used on July 11, 1990, did not contain criteria to ensure that the diversion of flow through the ion exchanger to the waste system, would be long enough to divert all the diluted water prior to realigning the system to the VCT. As a result of this event, the procedure was revised to require a 8-10 minute flush.

The occurrence of both of these prior events indicated that the licensee had not effectively incorporated lessons learned in the accomplishment of this task.

2.6 Conclusions

The RCS dilution event resulted from a combination of contributory factors. Inadequate command and control of licensed activities resulting from a lack of direction and oversight by the LSO was a major contributor. Poor communications, a failure to utilize procedures, and weak procedures were also contributors. An ineffective questioning attitude by control room personnel exacerbated the situation. Weaknesses with the oversight of crew composition and of inactive license activation requirements also played a role in the loss of command and control. The failure to consider the effect of shift change on

evolutions having potential impact on reactivity resulted in a failure to ensure a heightened sensitivity by operators. In general, a failure of operators to implement procedural requirements and management expectations led to inadequate control of activities and indicated a lack of attentiveness to licensed duties.

3 POSITIVE REACTIVITY ADDITION WITHOUT CONTAINMENT INTEGRITY ESTABLISHED

On November 13, 1993, the Fort Calhoun Station was in its 14th refueling outage, with all CEAs inserted to the bottom of the reactor. The licensee was in the process of performing a surveillance test on the secondary CEA position indication system. At the time that testing was initiated, containment integrity had not been established. The test required that one CEA at a time be withdrawn approximately 2 inches from the bottom position to test the rod block circuitry.

The event started when an operator was withdrawing CEA 30. Because of electrical grounds on the system, CEA 31 also began moving upward. The movement of CEA 31 was undetected until it was fully withdrawn. The NRC dispatched an AIT to the site to investigate the circumstances surrounding this event, which are documented in NRC Inspection Report 50-285/93-25.

The AIT identified that the failure to detect the movement of CEA 31 was caused, in part, by a lack of attention to detail by the operators during their response to the associated alarms. The CONTINUOUS ROD MOTION alarm annunciated during the surveillance testing. The operators performed the minimum requirements and turned the rod mode selector switch to the OFF position, as required by the alarm response procedure. However, the operators did not determine, by the use of other CEA position indications, that uncontrolled CEA motion had occurred. This lack of attentiveness continued throughout trouble shooting activities. As a result, control element assembly withdrawal was unmonitored.

The AIT also concluded that procedure enhancements were needed to address uncontrolled CEA motion events. The directions provided in the procedure, for response to a CONTINUOUS ROD MOTION alarm, was considered to be weak in that, while it required the operator to cease CEA motion, it did not direct the operators to locate the CEA that had moved.

The failure to detect the movement of CEA 31 and weak procedural support were indicators of less than adequate control of activities and was an indication of a lack of attention by operators to licensed activities.

TS 2.6(1)d requires that no positive reactivity changes be made without containment integrity, with the exception of testing one CEA at a time. During the event, two CEAs were moved (one inadvertently), causing positive reactivity changes while containment integrity had not been established. The failure to satisfy the requirements of TS 2.6(1)d is an apparent violation (285/9406-02).

4 FOLLOWUP (92701)

4.1 (Closed) Unresolved Item 285/9326-02: Auxiliary Feedwater (AFW) Pump Inoperability

On December 9, 1993, both trains of auxiliary feedwater were rendered inoperable during the performance of Procedure SE-ST-AFW-3005, Revision 6, "Auxiliary Feedwater Pump FW-6 and Check Valve Test." A description of the event and the associated interim corrective measures are discussed in NRC Inspection Report 50-285/93-26.

4.1.1 Root Cause Evaluation

The inspector determined that the event was primarily caused by an inadequate procedure in that the steam-driven AFW pump (FW-10) was not returned to operable status prior to operation of the motor-driven AFW pump (FW-6) in the recirculation mode for surveillance testing, which caused Pump FW-6 to also be inoperable. Procedure SE-ST-AFW-3005 was inadequate in that it did not provide clear direction for returning equipment to an operable status prior to rendering equipment inoperable. This is an apparent violation of TS 5.8.1 (285/9406-03).

A contributing cause was the lack of understanding on the part of the control room operators of written guidance pertaining to the evaluation of equipment operability during surveillance testing. Based on interviews performed by the inspectors, it was established that the operating staff believed that equipment was still operable, even though automatic initiation functions were defeated, as long as the equipment was being surveillance tested. The operators believed the equipment remained operable because action could be taken to restore the system to the emergency alignment if system actuation was required. This understanding by operations personnel directly conflicted with Nuclear Operations Division Quality Procedure NOD-QP-31, "Operability and Reportability Determinations," which specified that credit for operator action could only have been taken if the surveillance procedure provided specific instructions to that effect. No evidence of operator training on this aspect of Procedure NOD-QP-31 could be established.

During the performance of Procedure SE-ST-AFW-3005, an RO identified that the Pump FW-10 steam supply stop valve (YCV-1045) was not returned to the AUTO position prior to running Pump FW-6 in the recirculation mode. Without the switch in the AUTO position, automatic initiation of Pump FW-10 would not occur. After discussing this observation, the operators concluded that it would be acceptable to continue the surveillance test provided contingency actions for initiating the AFW system were established. The control room staff was briefed on what it would take to return the system to service. The impromptu compensatory measures had not been specified in the surveillance procedure, as required by Procedure NOD-QP-31.

Procedure SE-ST-AFW-3005 was approved on September 26, 1993. During the review of this procedure, the reviewer identified that the step for restoring

the normal alignment of Valve YCV-1045, the steam supply stop valve for Pump FW-10, was not included. Based on the promise of the preparer to include the restoration step, the reviewer signed off indicating that his review was complete. The preparer added the restoration step, but failed to include the step at the correct location in the procedure. The restoration step was added at the end of the procedure, rather than after completion of check valve testing. Adding the restoration step at the correct location would have restored Pump FW-10 to its normal alignment prior to running Pump FW-6 in the recirculation mode.

A second contributing cause was an inadequate evaluation of a 1990 procedure revision on the effect of the operability of Pump FW-6, which changed the test from a mini-flow to a full-flow surveillance test. Prior to this event, the operating staff did not understand that placing the system in the full-flow recirculation lineup rendered Pump FW-6 inoperable. After initiation of the full-flow recirculation testing on December 9, 1993, the shift supervisor became concerned about the impact of the test lineup on the operability of Pump FW-6. The licensee determined that in the full-flow recirculation lineup, Pump FW-6 was inoperable. If called upon to function during full-flow recirculation, pump capacity was not sufficient to provide required flow to the steam generators.

The failure to have both auxiliary feedwater pumps operable is an apparent violation of TS 2.5(1), which requires that the reactor coolant shall not be heated above 300°F, unless the motor- and steam-driven AFW pumps are operable (285/9406-04).

4.1.2 Conclusions

The inspector determined this event was primarily caused by an inadequate procedure. Pump FW-10 was not returned to operable status prior to running Pump FW-6 in the full-flow recirculation mode. A contributing cause was the lack of understanding of management's expectations for evaluating operability of equipment during surveillance testing. A second contributing cause was inadequate evaluation of the effect of a 1990 procedure revision on the operability of Pump FW-6, which changed the test from a mini-flow to a full-flow surveillance test.

The failure to stop testing, until all concerns were evaluated, indicated weak command and control by the control room operators. As a result, activities important to plant safety were less than adequately controlled.

4.2 (Closed) Unresolved Item 285/9326-03: Mispositioning of Control Room Dampers

On December 30, 1993, both trains of the toxic gas monitors became inoperable because the recorder trace paper ran out. With both trains of toxic gas monitors inoperable, TS 2.22 requires that the control room ventilation system be placed in the recirculation mode. This action was not accomplished. The inspectors previously noted, in NRC Inspection Report 50-285/93-26, that two

conditions contributed to this event. The first was that the operators were not fully cognizant of the individual ventilation system component response to an initiation signal. The second was that the clearance order tag, which had been hung on the Train B Air Conditioning Unit VA-46B control switch to indicate that it was out of service, was covering the Train B ventilation system control switch and made it appear that it also had been taken out of service. The inspectors determined that further review of this event was required to determine the reasons for the actions by operations personnel.

Following the failure of the toxic gas monitors, the LSO placed Train A of the control room ventilation system in the recirculation mode but chose not to put Train B in the recirculation mode. The LSO made this decision because the Train B recirculation fan was out of service for maintenance and he incorrectly assumed that the out-of-service boundary associated with the clearance order tag on Unit VA-46B was sufficient to accomplish the same function as placing the system in recirculation. As the result of this review, the inspector determined that the event was primarily caused by the LSO's lack of familiarity with the operation of the system.

A contributing cause was the failure to follow administrative requirements associated with determining that the step for placing Train B in the recirculation mode was not applicable. Standing Order SO-G-7, "Operating Manual," Step 5.7.3, states, in part, that any step N/A'd within an operating procedure or instruction must be initialled, dated, and fully explained. The failure to document or explain the determination that the step for placing Train B in the recirculation mode was not applicable is an apparent violation of TS 5.8.1 (285/9406-05).

A second contributing cause was an inadequate procedure. The procedure did not include all the equipment affected by manipulation of the mode switch and as a result was misleading to the operators. Specifically, operating Instruction OI-VA-3, "Control Room Ventilation System Normal Operation," Attachment 4, "Recirculation (Recirc) Operation," did not list Air Supply Fans VA-63A and -63B as being impacted by manipulation of Mode Switches HC-VA-46A-1 and -46B-1, respectively. This contributed to the LSO's misunderstanding of the system's operation in the recirculation mode. The failure of Operating Instruction OI-VA-3 to provide adequate operating instructions is an apparent violation of TS 5.8.1 (285/9406-06).

A third contributing cause was labeling of the mode switches. Mode Switches HC-VA-46A-1 and -46B-1, "CONT RM A/C Alignment," were located near the control switches for Air Conditioning Units VA-46A and -46B. Both sets of controls used the number 46 in the nomenclature rather than 63, which was used in the equipment identification number for Air Supply Fans VA-63A and -63B. The labeling on the mode switches only referred to the air conditioning units. This contributed to the operator's incorrect assumption that Mode Switches HC-VA-46A-1 and -46B-1 only affected Air Conditioning Units VA-46A and -46B and not Air Supply Fans VA-63A and -63B.

4.2.1 Apparent Violation of TS 2.22

TS 2.22 requires, in part, that toxic gas monitors be operable as provided in Table 2-11. If the required instrumentation is not operable, the appropriate action specified in Table 2-11 shall be taken. Table 2-11, Action (b) requires that with both toxic detectors inoperable, within 1 hour initiate and maintain operation of the control room ventilation system in the recirculation mode of operation.

On December 30, 1993, Toxic Gas Monitors YIT-6286A and -6286B were inoperable at 12:15 a.m. Both trains of the control room ventilation system were not placed in the recirculation mode of operation until 4:05 a.m. on December 30. This was an apparent violation of TS 2.22 (285/9406-07).

4.2.2 Conclusions

The inspectors determined that this event was primarily caused by inadequate operator understanding of the system, with contributing causes involving a lack of procedure adherence, procedure inadequacies, and control board labeling inadequacies.

ATTACHMENT

1 PERSONS CONTACTED

1.1 Licensee Personnel

R. Andrews, Division Manager, Nuclear Services
G. Cavanaugh, Licensing Engineer
J. Chase, Manager, Fort Calhoun Station
J. Connolley, Lead System Engineer
R. Conner, Assistant Manager
G. Cook, Supervisor, Station Licensing
M. Core, Supervisor, Electrical Instrumentation and Control
M. Elzway, Nuclear Design Engineer
J. Gasper, Manager, Training
R. Jaworski, Manager, Station Engineering
L. Kusek, Manager, Nuclear Safety Review Group
D. Lippy, Station Licensing Engineer
R. Luikens, Coordinator, Emergency Operating Procedure
W. Orr, Manager, Quality Assurance and Control
T. Patterson, Division Manager, Nuclear Operations
R. Phelps, Manager, Design Engineering
R. Short, Manager, Nuclear Licensing
J. Tills, Supervisor, Operations
D. Trausch, Acting Manager, Training
W. Weber, Supervisor, Reactor Performance

1.2 NRC Personnel

R. Azua, Resident Inspector, Fort Calhoun Station
K. Kennedy, Resident Inspector, Comanche Peak Steam Electric Station
C. Paulk, Reactor Inspector
R. Mullikin, Senior Resident Inspector, Fort Calhoun Station
L. Smith, Senior Resident Inspector, Arkansas Nuclear One
T. Stetka, Chief, Project Branch D
J. Tapia, Reactor Engineer/Examiner

2 EXIT MEETING

An exit meeting was conducted on January 28, 1994. During this meeting, the inspectors reviewed the scope and findings of the report. The licensee acknowledged the information presented at the exit meeting. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.