ENCLOSURE 2

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-483/95-18

License: NPF-30

Licensee: Union Electric Company
P.O. Box 149
St. Louis, Missouri

Facility Name: Callaway Plant

Inspection At: Callaway Plant, Steedman, MO

Inspection Conducted: December 24, 1995, through February 3, 1996

Inspectors: D. G. Passehl, Senior Resident Inspector
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Approved: William D. Johnson, Chief, Project Branch B — Date 2/23/96

Inspection Summary

Areas Inspected: Routine, announced inspection of onsite response to events, operational safety verification, plant support, maintenance, surveillance, onsite engineering, followup plant operations, followup maintenance, followup engineering, followup plant support, and onsite review of licensee event reports was conducted.

Results:

Onsite Response to Events

- The licensee's immediate response to a blocked Ultimate Heat Sink Train B sump was appropriate (Section 2.1).
- Plant operators responded well to an Emergency Diesel Generator B start failure during a postmaintenance test (Section 2.2).
- Plant operators' performance during a power decrease following the failure of Main Feedwater Regulating Valve B was well planned and executed. The plant simulator proved a useful tool in preparing for the plant downpower (Section 2.3).

Operational Safety Verification

- A shift turnover conducted on January 17, 1996, was inadequate. This was a violation. In addition, a similar violation was identified in NRC Inspection Report 50-483/95-08 (Section 3.2).

- There was good control of plant parameters by primary and secondary operators during the power ascension following repairs to Main Feedwater Regulating Valve B. However, some communication weaknesses were noted (Section 3.3.1).

- The quality of pretest briefs conducted by plant operators was mixed (Section 3.3.3).

- The plant operated with few or no illuminated annunciators and with few disabled annunciators. However, there were other indicators in the control room and in the back panel area behind the control room which were nonfunctioning (Section 3.5).

- Operator actions upon discovery of a large amount of condensate in the casing of the auxiliary feedwater pump turbine were appropriate. However, an operator work-around was necessary to maintain the auxiliary feedwater pump turbine operable (Section 5.3).

Plant Support Activities

- Radiologically controlled areas were maintained at a satisfactory level of cleanliness (Section 4.1).

- A briefing held for an at-power containment entry was very good (Section 4.1.1).

- Plant security responded well to an empty liquor bottle found outside the containment emergency personnel escape hatch outer door (Section 4.2).

- A noncited violation (NCV) was identified for a system misalignment by radwaste technicians during transfer of the contents of Recycle Holdup Tank B to Boric Acid Tank B (Sections 4.1.2 and 11).

- An NCV was identified during closeout of a licensee event report for failure to properly perform Technical Specification surveillances on containment gaseous radioactivity channels and containment high range radiation channels (Section 12).

Maintenance Observations

- Maintenance demonstrated good support during repairs to Main Feedwater Regulating Valve B (Section 5.1).

- Maintenance demonstrated good support during repairs to an air distribution valve on Emergency Diesel Generator B (Section 5.2).

- The rigging setup for work on main turbine steam seal supply from Main Steam Bypass Valve CAHV0002 was inadequate for preventing damage to the valve parts (Section 5.4).

- Excellent documentation of maintenance history was noted for work on Valve BBHCI8157A (Section 5.5).

Surveillance Observations

- The licensee's immediate actions in walking down the system piping and initiating corrective action for a potential problem with the operation of Safety Injection Pump A Discharge To Hot Leg Injection Isolation Valve EMHV8802A were appropriate (Section 6.1).

- The licensee's followup investigation for a gas entrapment problem in the Safety Injection Pump A discharge piping was generally well-planned and executed. However, a communication weakness was noted regarding operations personnel alerting engineering personnel to venting processes occurring (Section 6.2).

- Surveillance test procedures for the emergency diesel generators were cumbersome. Management was appropriately taking action to improve the quality of the procedures (Section 6.3).

- The licensee conservatively performed single air system tests on the emergency diesel generators ahead of the prescribed schedule to address a potential generic problem with the air starting systems (Section 5.2).

Onsite Engineering

- There was good support from the emergency diesel generator system engineer during troubleshooting of an air start system failure on the emergency diesel generator. However, appropriate technical support did not arrive on site for several hours following the failure of the emergency diesel generator (Section 7.1).

- Engineering support during the plant downpower to repair Main Feedwater Regulating Valve B was appropriate (Sections 2.3 and 5.2).

- Engineering's investigation into condensation in the auxiliary feedwater pump turbine casing was appropriate (Section 5.3).

- The licensee's corrective and preventive actions addressing containment air cooler low flows appear to have been effective. The licensee conducted a thorough root cause analysis and implemented effective corrective actions (Section 10.1).

Summary of Inspection Findings:

- Inspection Followup Item 483/9518-01 was opened (Section 2.1).
- Violation 483/9518-02 was opened (Section 3.2).
- Inspection Followup Item 483/9518-03 was opened (Section 5.3).
- Inspection Followup Item 483/9518-04 was opened (Section 6.1).
- Inspection Followup Item 483/9518-05 was opened (Section 6.2).
- Violation 483/9504-01 was closed (Section 8).
- Inspection Followup Item 483/9506-05 was closed (Section 9).
- Inspection Followup Item 483/9404-01 was closed (Section 10.1).
- Inspection Followup Item 483/9504-02 was closed (Section 10.2).
- Unresolved Item 483/9517-01 was closed with an NCV (Section 11).
- Licensee Event Report 94-003 was closed with an NCV (Section 12).

Attachments:

- Attachment - Persons Contacted and Exit Meeting

DETAILS

1 PLANT STATUS (71707)

The plant operated at full power throughout most of the inspection period. One significant power level change occurred on January 15, 1996. Plant operators decreased reactor power to approximately 2 percent to repair Main Feed Regulating Valve B (Sections 2.3 and 5.1). Repairs were satisfactorily completed, and the plant was returned to 100 percent power on January 16, 1996.

2 ONSITE RESPONSE TO EVENTS (93702)

2.1 Ultimate Heat Sink Train B Sump Blocked With Ice

On January 3, 1996, a plant equipment operator performing his daily sump inspection found the Ultimate Heat Sink Train B sump blocked with several inches of ice. Plant operators declared the Ultimate Heat Sink Train B sump inoperable, which placed the plant in a 72-hour shutdown Action Statement per the Technical Specifications. The licensee's immediate action was to have maintenance workers break up the ice. The plant exited the Technical Specification Action Statement approximately 30 minutes later.

The ultimate heat sink consists of one mechanical draft cooling tower and a retention pond. The basin of the mechanical draft cooling tower contains two ultimate heat sink sumps (one per train). Each sump provides a return flowpath for essential service water back to the retention pond. Each sump is connected to the retention pond by a 36-inch pipe. Essential service water flows through the sumps to the retention pond by gravity. Normal level in the retention pond results in standing water in the ultimate heat sink sumps. Two immersion heaters per sump are provided to prevent ice formation when the mechanical draft cooling tower fans are idle. The heaters are energized by separate temperature switches that turn on the heaters when the sump temperature reaches 40°F and deenergize the heaters when the sump temperature reaches 50°F.

The licensee found the formation of ice to be due to the failure of both temperature switches in the Ultimate Heat Sink Train B sump. As an immediate corrective action, the licensee implemented a temporary modification to jumper around the temperature switches so that the heaters remained energized. As a long term corrective action, plant engineers developed a permanent modification, to be installed later this year, to increase the reliability of the system. Some aspects of the permanent modification were:

- Mounting the temperature switches on the wall instead of in the process fluid, as is the current configuration;

- Replacing all conduit boxes and mounts with stainless steel for corrosion resistance;

- Installing an auto/manual on switch to allow bypass of the temperature switches in the event of a problem with the switch during cold weather;

- Implementing a new preventive maintenance activity to calibrate the temperature switches and verify heater operation on a periodic basis.

By the end of this inspection period, the licensee had not definitively found the root cause for failure of both temperature switches. One possible cause being explored was a calibration error. The inspectors also noted that the licensee eliminated a preventive maintenance task on the switches back in 1988. The licensee was unsure of the reason for eliminating the preventive maintenance task. Plant engineers were investigating the various issues at the close of this inspection. Pending completion of the licensee's root cause investigation and reason for deleting the preventive maintenance task on the switches, this is considered an inspection followup item (Inspection Followup Item 483/9518-01).

The inspectors concluded that the plant equipment operator exhibited good attention to detail during plant rounds which resulted in finding the blockage. Plant operators' response after discovering the blockage was appropriate. The long term corrective actions described by the permanent modification appear appropriate.

2.2 Emergency Diesel Generator B Start Failure

At approximately 2 a.m. on January 9, 1996, the licensee removed Emergency Diesel Generator B from service for a planned maintenance outage. This placed the plant in a Technical Specification 72-hour Limiting Condition for Operation Action Statement. At approximately 1 a.m. on January 10, 1996, following the maintenance work, the licensee attempted to start the diesel for a postmaintenance test. Due to a problem in the air start system, the diesel failed to start.

Each emergency diesel generator has two air start systems. Each system was designed to be able to independently start the diesel in the required time. Normally, for routine surveillance runs, the licensee started the diesel using both systems. Periodically, the licensee tests the emergency diesel generator with one air start system to ensure that the air systems functioned properly. For the January 10 test, the licensee attempted to start the diesel using only Air Start System C. Due to a problem with the air distributor valve in Air Start System C the diesel failed to start.

At approximately 12:40 p.m. on January 11, 1996, following troubleshooting, repair, and a successful retest, the licensee declared Emergency Diesel Generator B operable and exited the Technical Specification Limiting Condition for Operation. Plant operators responded well to this event. Support from

maintenance and engineering departments was good during the followup investigation. However, technical support to the operations' staff from engineering personnel immediately after the failure was lacking, as plant operators initially struggled in their attempts to find the cause of the failure. The engineering representative on site assisting in the initial troubleshooting was not the system engineer for the diesel generator and was not completely familiar with the system. Appropriate engineering support personnel were not onsite until several hours after the failure occurred. Plant management stated that adequate technical support during off-normal hours is usually afforded plant operators, and that this appears to be an exception. Refer to section 5.2 in this report for a discussion on the failure mechanism and repair effort.

2.3 Plant Downpower To Mode 2 To Repair Main Feed Regulating Valve B

On January 15, 1996, at approximately 12 p.m. (CST), operators decreased reactor power to approximately 2 percent to repair Main Feedwater Regulating Valve B. Plant operators noted a reduction in feedwater flow to Steam Generator B that caused Feedwater Regulating Valve B to open a few percent more than the other three feedwater regulating valves in order to maintain programmed steam generator level. This indicated that the valve had operated improperly.

The licensee determined that the Main Feedwater Regulating Valve B stem had partially unscrewed from the actuator. This caused the valve disc to close, thereby, reducing feedwater flow. The actuator then opened the valve further in order to compensate for the reduced flow.

The inspectors responded to the site to observe the licensee's response to this event. The oncoming operating crew, which was scheduled to begin the reactor power decrease, arrived onsite early to practice on the plant simulator. Operations management effectively covered the details and discussed precautions, potentials problems, and contingencies. Later, plant operators performed the actual downpower evolution without incident.

Plant operators' performance during the downpower maneuver was very good. The evolution was well planned and executed. The plant simulator proved to be a useful tool in preparing for the plant downpower. Good coordination and communication among the various groups involved was noted.

2.4 Conclusions

The licensee's immediate response to the blocked Ultimate Heat Sink Train B sump was appropriate. The long term corrective actions will be followed in a future inspection.

Plant operators responded well to the Emergency Diesel Generator B Start failure.

Plant operators' performance during the downpower maneuver was very good. The evolution was well planned and executed. The plant simulator proved a useful tool in preparing for the plant downpower.

3 OPERATIONAL SAFETY VERIFICATION (71707)

3.1 Routine Control Room Observations

The inspectors observed operational activities throughout this inspection period to verify that adequate control room staffing and control room professionalism were maintained. Discussions with operators indicated that they were aware of plant status, equipment status, and reasons for illuminated annunciators. Control room indications of various valve and breaker lineups were verified for current plant status.

3.2 Inadequate Operator Shift Turnover

On January 17, 1996, the inspectors observed an inadequate shift turnover. The oncoming balance-of-plant operator failed to review the control room narrative logs prior to assuming the watch. In addition, the entire turnover process took approximately 2 minutes, further indicating that the shift turnover was not thorough.

Licensee Operations Department Procedure (ODP) ZZ-00003, "Shift Relief and Turnover", Revision 10, Step 4.3.2.1 stated that prior to relief, the relieving balance-of-plant operator shall review the pertinent information in the reactor operator logs for the last 24 hours or their last watch, whichever is shorter. The failure of the balance-of-plant operator to review pertinent information in the reactor operator logs prior to assuming the watch was a violation of ODP-ZZ-00003 (483/9518-02).

NRC Inspection Report 50-483/95-08 identified a violation when several reactor operators failed to review the control room narrative logs prior to assuming the watch. Although the licensee's corrective actions for the previous violation were not totally effective as evidenced by this violation, only a single operator was involved.

The licensee took several actions as a result of the current violation:

- Disciplinary action was taken against the oncoming balance-of-plant operator for the poor shift turnover;
- The off-going balance-of-plant operator was counselled on the responsibility for ensuring proper shift turnover;
- The requirement for proper turnovers was discussed with other operators on shift;

- The quality assurance group began an audit of the plant operations department in the areas of shift turnovers, operator rounds, procedure use, computer software controls, and corrective actions.

In addition, during observations of a second shift turnover on January 19, 1996, the inspectors observed operators turnover of the Primary Operator position. The entire turnover process took approximately 5 minutes, did not include a control board walkdown, and did not include any tour of the panels behind the control room. While the inspectors noted that the turnover complied with the procedural requirements of ODP-ZZ-00003 and was, therefore, adequate, the inspectors concluded that the shift turnover could have been more thorough.

Plant management responded that control board walkdowns and tours of the back panels were not necessary prior to watch relief. Control board walkdowns were frequently performed shortly after watch relief. In addition, operators enter the back panel area once per shift to take log readings. Management stated that operators were expected to know the status of equipment, reasons for lit annunciators, etc., after assuming the watch.

3.3 Operating Crew Communications During Power Ascension

The inspectors had several observations regarding operating crew communication during the power ascension following the repair to Main Feedwater Regulating Valve B.

3.3.1 Formal Communication

On January 16, 1996, while restoring the main feedwater lineup, the balance-of-plant operator used the phrases "go for it," and "go ahead," to direct the equipment operator to fully open the isolation valves. In addition, operators frequently did not use formal repeatbacks as expected by management. Operations management acknowledged that weaknesses in communications exist and had begun to implement plans to improve.

3.3.2 Receipt Of Control Room Alarms

Operators did not announce the receipt of annunciators or whether the received annunciators were expected. One example was on January 16, 1996, during the main turbine startup, when operators received several fire monitoring panel alarms.

Operations management stated that there was no expectation to announce alarms to other operators in the control room, and that this practice was up to the individual operator's judgment. Management stated that at one point the practice of announcing all alarms was tried with unsatisfactory results, especially during involved plant evolutions when more important communications were cluttered with announcement of expected alarms. However, management

stated that control room communications was an item for improvement and had initiated action to improve performance in that area.

The inspectors acknowledged that verbal alarm acknowledgement was not required by NRC regulations. The inspectors further noted that while the potential existed, these practices regarding alarms had not actually caused operating concerns.

3.3.3 Performance Of Pretest Briefs

Operator performance of pretest briefs was mixed. Prior to the main turbine startup, the operating crew held a pre-evolution briefing that provided very clear expectations, discussed contingencies, and answered several questions raised by the operators. The inspectors concluded that this pre-evolution briefing was very good.

On the other hand, prior to the Safety Injection Pump B surveillance test on January 18, 1996, the pretest briefing did not include a discussion of flowpath, practices to limit the time the pump would be run in a low flow condition, individuals assigned to specific tasks, contingencies, etc. The inspectors concluded that this pretest briefing was adequate, but was not utilized as effectively as the pre-evolution briefing prior to the turbine startup.

Management recognized that the quality of pre-test briefs could be improved, and had begun taking action in this area. For example, effort had begun to establish a data base of prior lessons learned which would be utilized as a resource for operators in pretest and pre-evolution briefings.

3.4 Plant Tours

The inspectors routinely toured various areas of the plant to assess safety conditions and adequacy of plant equipment and lineups. The inspectors verified that various valve and switch positions were correct for the current plant conditions. Piping and instrumentation drawings and operating instructions posted in vital areas were inspected and found to be current. Personnel were observed obeying rules for escorts, visitors, entry, and exits into and out of vital areas. During various plant tours, the inspectors noted several minor material condition and housekeeping deficiencies. The inspectors informed the licensee of these issues.

3.4.1 Control Room Lamp Indications

During one control room tour, the inspectors noted a number of nonfunctioning indicating lamps in the control room and in the back panel area behind the control room. Examples included the Main Feedwater Pump A turbine reset indicator, numerous annunciator windows, eight indications on the nuclear instrumentation cabinets, and indicators on the loose parts monitoring cabinet and hydrogen recombiner cabinet. None of the nonfunctioning indicating lamps caused operating problems since operators had either multiple lamps for a

single indication, or redundant indication of the failed indicator. All of the lamps were appropriately replaced.

Although none of the failed indicators caused operators difficulty in monitoring the plant, they did increase the risk that additional lamp failures could cause confusion. Management's expectations were that shift supervisors were tasked with initiating action to replace nonfunctioning indicating lamps. The licensee also stated that discussions were held with all operators to reinforce management's expectations on this issue.

3.4.2 Rod Position Step Counter

The inspectors also noted that the rod position step counter for one control rod group was stuck between five and six. The control room operator said that this was not a problem and described similar conditions in the simulator. The rod position step counter was adjusted by the end of this inspection.

3.4.3 Radiation Monitor Local Indicating Lamp Lenses Reversed

The inspectors noted that while most radiation monitors in the auxiliary building had proper local indication, the local indicating lamp lenses for the Fuel/Auxiliary Building Gas Detector GGRE0028 and Containment Building Air Exhaust Plenum (Unit Vent) Particulate and Iodine Monitor GTRE0021A had been reversed. As a result, the inlet valve open indication had a green lens, and the purge valve close indication had an amber lens. The indication was opposite the industry standard for valve position indication, and could, therefore, cause confusion. The licensee switched the lenses to the correct configuration.

3.5 Other Observations

The inspectors noted that the plant operated with few or no illuminated annunciators, with few disabled annunciators, and that plant personnel expressed a strong commitment to the "dark board" concept. The inspectors concluded that this represented good attention to an issue that could otherwise contribute to operator confusion. The inspectors also noted good operator control of plant parameters during the turbine startup and power ascension.

Examples of good control included the secondary operator receiving very few steam generator level deviation alarms, even while opening the feedwater regulating valves; and the primary operator maintaining good control of the reactor average temperature and pressurizer level. The inspectors concluded that operators understood their objectives and knew how to accomplish them. The operators also made good Gaitronics announcements for major plant evolutions, thus enhancing the crew coordination between control room and field operators, as well as providing an important safety function. The inspectors concluded that these strengths demonstrated appropriate operator focus on safe plant operation.

3.6 Conclusions

- A shift turnover conducted on January 17, 1996, was inadequate.
- There was good control of primary and secondary parameters during the power ascension.
- Operator performance of pretest briefs was mixed.
- The inspectors noted a number of nonfunctioning indicating lamps in the control room and in the back panel area behind the control room. Management's expectations in this area were not being met.
- The plant operated with few or no illuminated annunciators with few disabled annunciators.

4 PLANT SUPPORT ACTIVITIES (71750)

The inspectors sampled selected activities in the different areas of plant support and verified that they were implemented in conformance with licensee procedures and regulatory requirements.

4.1 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.

4.1.1 At-Power Containment Entry Briefing

On January 17, 1996, the inspectors attended a briefing for an at-power containment entry. The entry was to perform corrective maintenance activities. A number of items were discussed, which included health physics coverage, foreign material exclusion, personnel safety, and work scope. All personnel were given an opportunity to express their concerns. Overall, the briefing was very good.

4.1.2 Valve Alignment Error During Transfer of Recycle Holdup Tank B to Boric Acid Tank B

An unresolved item was identified and discussed for this issue in NRC Inspection Report 50-483/95-17. The item is closed as described in Section 11 of this report.

4.2 Security Program Observations

The inspectors observed various aspects of the licensee's security program. Security personnel were found to perform their duties in a professional manner. Vehicles were properly controlled or escorted within the protected area. Designated vehicles parked and unattended within the protected were found to be locked and the keys removed. The inspectors routinely toured the protected area perimeter and found it maintained, as required. Proper compensatory measures were observed when a security barrier was inoperable.

The inspectors identified one item of concern and passed it on to site and regional security specialists. The inspectors found an empty liquor bottle outside the containment emergency personnel escape hatch outer door. Onsite security personnel commenced an immediate investigation.

The licensee's investigation found that the bottle had likely been brought onsite during the construction phase of the plant over ten years ago. This was based on an analysis of the labelling still intact on the bottle. The bottle was likely brought onsite prior to formal implementation of the security program and receipt of new fuel onsite. The licensee's investigation into this matter was closed.

4.3 Conclusions

The licensee's overall performance was satisfactory. Radiologically controlled areas were maintained at a satisfactory level of cleanliness.

A briefing held for an at-power containment entry was very good.

The licensee's response to an empty liquor bottle found outside the containment emergency personnel escape hatch outer door was good.

5 MAINTENANCE OBSERVATIONS (62703)

The maintenance activities listed below were observed and documentation reviewed to verify that the activities were conducted in a manner which resulted in reliable safe plant operation.

The following maintenance activities were observed:

5.1 Work Request P516463, Repair Main Feedwater Regulating Valve B

As discussed in Section 2.3, plant operators brought the plant to Mode 2 to repair Main Feedwater Regulating Valve B.

Maintenance workers found the problem with the valve to be a locking bar mechanism that did not work as designed. The locking bar was designed to keep the stem of the valve from rotating. The locking bar had cap screws that threaded into the actuator. Although maintenance workers found the cap screws

torqued to 20 foot-pounds as required by the vendor manual, this was found to be inadequate.

The licensee's short term actions to prevent recurrence were to increase the torque on the cap screws to 30 foot-pounds. In addition, plant personnel match-marked the stem to allow personnel to visually check for stem rotation. To date, there has been no rotation of the stem. For the longer term, the licensee is researching an improved locking mechanism design. The licensee's actions were also implemented on the other three feedwater regulating valves.

The inspectors concluded that maintenance and engineering support to plant operations personnel was good. Coordination was excellent, as plant personnel completed the downpower, made repairs, and returned the plant to full power approximately 36 hours later.

5.2 Work Request W579183 - Trouble Shoot and Repair Emergency Diesel Generator B Air Start System

Emergency Diesel Generator B failed to start following a planned maintenance outage (Section 2.2). After exploring several possible causes, the licensee found the problem to be with the air distribution valve in Starting Air Bank C. The air distribution valve directs air to the engine cylinders to start the diesel. Due to a loose rotor, the valve's timing was off. Therefore, starting air was not admitted to the cylinders in the correct sequence. The licensee repaired the valve and successfully tested the emergency diesel generator using Starting Air Bank C.

The inspectors questioned the licensee on the condition of the other air distribution valves. Recent test results suggested that the air starting systems for Emergency Diesel Generator A were in satisfactory condition. Emergency Diesel Generator A was test started using Starting Air Bank A on January 24, 1996. Emergency Diesel Generator A was test started using Starting Air Bank B on December 27, 1995. The most recent test of Emergency Diesel Generator B using Starting Air Bank D was on February 7, 1996. All of these tests were satisfactory. The January 24, 1996, and February 7, 1996, tests were conducted ahead of schedule.

Since inspecting the valves would necessitate rendering the emergency diesel generator inoperable, the inspection of the other air distribution valves is planned during the next scheduled maintenance outage. The inspection would consist of manually positioning the cylinders at a known position to determine whether the air distribution valve was set to the proper sequence and whether a shift in the valve position had taken place.

The inspectors noted that the emergency diesel generator system engineer was very knowledgeable and quickly concluded which components could have caused the air start system failure. The engineer provided on the scene support to the maintenance personnel investigating the problem and contacted the equipment vendor for technical assistance. The knowledge and professionalism of the system engineer supported the timely repair of the air start system.

However, other engineering support was somewhat slow immediately following the failure.

Management exhibited a conservative operating philosophy in performing single air system tests ahead of schedule.

5.3 Work Request W176459 - Steam Leak From Gland on Pump End of Auxiliary Feedwater Terry Turbine KFC02

During the licensee's investigation of steam leakage past Auxiliary Feedwater Pump Trip and Throttle Valve FCHV0312, the operations field supervisor and the system engineer observed significant condensate flow from Turbine Exhaust Header Drain Valve FCV0090. Based on the assumption that there might be condensate in the casing of the Terry turbine, plant operators declared the auxiliary feedwater pump inoperable and entered a 72-hour Technical Specification Action Statement. The pump was rendered inoperable at 8:50 a.m. on January 25, 1996, when operators closed the steam supply manual isolation valves to the Terry turbine.

Plant operators continued to drain condensate from Valve FCV0090. A total of 51 gallons was drained. The licensee began an investigation into the source of the condensate and to determine whether the drain system was functioning properly. In parallel with that investigation, operators began to periodically open drains in the exhaust header to quantify and trend the amount of condensate being drained. At first, plant operators drained the exhaust header once per hour and collected about 0.5 gallons of condensate. The licensee determined that this amount was not an impediment to declaring the pump operable. Plant operators successfully performed surveillance testing on the pump, and declared the pump operable at 7:32 p.m. on January 25, 1996. The inspectors noted that the turbine driven auxiliary feedwater pump had been successfully tested on January 2 and January 11, 1996.

As a result of the investigation, the licensee took several actions that resulted in reduced build-up of condensate in the exhaust header. One example was fully opening Turbine Casing Drain Valve FCV0070. The valve had been throttled near the closed position prior to this event. In addition, after consulting with the vendor, personnel removed insulation from a section of pipe upstream of the exhaust header drain trap. These actions resulted in operators draining approximately one quart of condensate every 8 hours. Due to several inches difference in elevation between the drain valve and the drain trap, one quart corresponds to the amount of water that the interconnecting piping would be expected to retain.

Still, the licensee found that leakage through Valve FCHV0312 would provide a continuous source of condensate to the turbine drain system, thereby forcing a high reliance on the steam trap system to function properly. Should the capacity of the steam drain system sufficiently degrade, condensate would again back up into the turbine casing and exhaust line. Plant engineers were evaluating to determine the amount of condensate below which the turbine exhaust system should be maintained for pump operability.

The licensee was pursuing several other possible actions to enhance the turbine drain system, including a visual indicator of the amount of condensate in the exhaust header. In addition, planning had begun for repairing the leakage through Valve FCHV0312.

Finally, the inspectors noted that a problem reporting document was initiated by the licensee in October 1994 during a safety system functional assessment, for a concern where steam was observed discharging from the auxiliary feedwater pump turbine exhaust header. The details of that document and the licensee's response will be evaluated during a future inspection.

Pending the inspectors' review of the licensee's long term actions, and review of the October 1994 report, this is considered an inspection followup item (Inspection Followup Item 483/9518-03).

The inspectors concluded that the licensee's actions were appropriate. Immediate corrective actions to quickly restore the system to operable status were effective. Continued trip and throttle valve leakage has resulted in additional operator actions being required to drain the turbine drain piping once per shift until the leakage is repaired.

5.4 Work Request W174270, Replace Grease in the Motor Operator for Main Turbine Steam Seal Supply from Main Steam Bypass Valve CAHV0002

Maintenance personnel removed the motor operator from Valve CAHV0002 in order to replace the grease in the operator. Following removal of the operator, the inspectors noted that there were small pieces of metal mixed with the grease on the top of the valve stem. Upon further investigation, the inspectors realized that the top of the stem was chipped. After the actuator was disassembled, the inspectors noted that the tapered end of the threads for the stem nut was broken off. It appeared that the damage was done while the valve operator was being removed. The valve stem was originally installed at an angle. However, the operator was rigged vertically for removal.

The licensee determined that the stem and stem nut did not require replacement with new parts. Maintenance personnel reassembled the valve with the original parts and tested the valve with satisfactory results. The inspectors determined that the rigging setup for work on this valve was inadequate for preventing damage to the valve parts. Management stated that the rigging for this valve met minimum standards, but certainly could have been better.

5.5 Work Request W177424 - Feedback Indication Fails to Move When Stroking Excess Letdown to Pressurizer Relief Tank Modulating Control Valve BBHCI8157A

The inspectors observed instrumentation and controls technicians troubleshooting Excess Letdown to Pressurizer Relief Tank Modulating Control Valve BBHCI8157A. In the work package, the inspectors noted that each day the technicians worked on this problem, they used a sheet of paper to document the effort. On this sheet of paper they described the troubleshooting work

performed that day, making it very easy for anyone to understand the maintenance history. Discussions with the technicians confirmed that this type of documentation had been useful in familiarizing technicians with the work of previous crews who worked on the same problem. The inspectors concluded that this represented excellent documentation of maintenance history.

5.6 Other Maintenance Observed

The inspectors reviewed the following maintenance activities and had no significant observations.

- Work Request P523874 - Emergency Diesel Generator B Engine Driven Jacket Water Pump Discharge Pressure Switch Calibration Check.
- Work Request W174729 - Replace Pipelet on Emergency Diesel Generator B Rocker Arm Lube Oil Filter Outlet Pressure Relief Valve.
- Work Request P468235 - Emergency Diesel Generator B Lube Oil Cooler Inlet/Bypass Temperature Control Valve.

5.7 Conclusions

- Maintenance support to repair Main Feedwater Regulating Valve B was good.
- Maintenance support to find and repair a problem with an air distribution valve on Emergency Diesel Generator B was good.
- The rigging setup for work on Main Turbine Steam Seal Supply from Main Steam Bypass Valve CAHV0002 was inadequate for preventing damage to the valve parts.
- Excellent documentation of maintenance history was noted for work on Excess Letdown to Pressurizer Relief Tank Modulating Control Valve BBHCI8157A.

6 SURVEILLANCE OBSERVATIONS (61726)

The inspectors observed the surveillance testing listed below to verify that the activities were performed in accordance with the licensee's approved programs and the Technical Specifications.

6.1 OSP-EM-V001A - Train A High Pressure Coolant Injection Section XI Valve Operability

On January 17, 1996, the licensee opened Safety Injection Pump A Discharge to Hot Leg Injection Isolation Valve EMHV8802A as part of the above surveillance test. The inspectors and an equipment operator noted that the valve opened

hard out of its seat, giving a loud noise and causing the system piping to move approximately 1 inch. The inspectors and the equipment operator did not observe any damage to supports and restraints on the system in the immediate area of the valve.

Civil engineering personnel performed a detailed walkdown of accessible portions of the safety injection piping both inside and outside of containment. No piping or pipe support discrepancies were identified. The licensee believed that the cause of the piping movement was due to the sudden opening of the valve as it came off its closed seat. Licensee personnel reviewed Motor Operated Valve Actuator Testing System traces for the valve and concluded that the valve's operation was normal.

The licensee initiated a corrective action document to investigate the circumstances surrounding the operation of Valve EMHV8802A. The inspectors will review the licensee's completed investigation during a later inspection. Pending that review, and a review of the history of the valve's operation, this is considered an inspection followup item (Inspection Followup Item 483/9518-04).

The inspectors concluded that the licensee's immediate actions in walking down the system piping and initiating a corrective action document were appropriate.

6.2 OSP-SA-00003 - Emergency Core Cooling System Flow Path Verification and Venting

During performance of OSP-SA-00003, the safety injection piping immediately upstream of Safety Injection Pump A Discharge to Hot Leg Injection Isolation Valve EMHV8802A was vented. The system was normally water-solid, but gas was vented from the system for approximately 5 minutes. The licensee commenced an investigation into the source of the gas.

Plant personnel obtained a sample of the gas during a subsequent vent evolution and determined by analysis that the gas was approximately 87 percent nitrogen and 13 percent oxygen which indicated that the gas was most likely from one or more of the plant's safety injection accumulators. The licensee subsequently revised the normal venting procedure to allow pressure in the safety injection pump discharge header to increase to a specified value to determine whether the leakage was from the reactor coolant system or the accumulators. On February 3, 1996, pressure increased to a maximum value of 550 psig giving further indication that the leakage was from the safety injection accumulators.

The licensee concluded that one of the safety injection pumps to reactor coolant system cold leg check valves may be leaking. The accumulator discharge piping shares a common flowpath with the safety injection pumps to reactor coolant system cold leg check valves. Plant engineers stated that the safety injection pumps to reactor coolant system cold leg check valves are in

the inservice pump and valve test program, and had satisfactorily met acceptance criteria for leakage during the last examination.

The licensee had plans to perform additional troubleshooting to determine which accumulator was the source of the leak. The inspectors will follow the licensee's investigation (Inspection Followup Item 483/9518-05).

Although the licensee's followup investigation was generally well-planned and executed, the inspectors noted that in some instances operators did not keep engineering personnel informed of venting evolutions that had occurred. Therefore, engineers were not aware of potential valuable data pertaining to the venting process that could have proved useful in troubleshooting. Operations management issued a night order instructing operators to inform plant engineering when venting had occurred.

6.3 OSP-NE-00002 - Standby Emergency Diesel Generator Periodic Tests
OTN-NE-00001 - Standby Diesel Generator System

The inspectors noted that the operator was required to perform the above two procedures to conduct emergency diesel generator tests and record results. The inspectors found the procedures cumbersome, as did plant operators. An operator was observed during one particular test to break the procedures into different stacks for ease of use. Further, the inspectors noted that the operator sometimes searched through sheets of paper to determine which procedure step was current. Although the testing observed was performed correctly with satisfactory results, a less experienced operator could encounter difficulty using the procedures.

Plant management agreed with this observation and had begun action to revise and rewrite the procedures to improve the quality. The goal was to have the improved procedures in place within the next few months.

6.4 Other Surveillance Observed

The inspectors reviewed the following surveillance tests and had no significant observations.

- ESP-GL-03009 - Auxiliary/Fuel Building Emergency Exhaust System A Filter Test.
- OSP-EM-P001A - Section XI Safety Injection Train A Operability.

6.5 Conclusions

- The licensee's immediate actions in walking down the system piping and initiating corrective action for a potential problem with the operation of Safety Injection Pump A Discharge to Hot Leg Injection Isolation Valve EMHV8802A was appropriate.

- The licensee's followup investigation for a gas entrapment problem in the Safety Injection Pump A discharge piping was generally well-planned and executed. However, a communication weakness was noted regarding operations personnel's failure to alert engineering personnel to venting occurrences.

- Surveillance test procedures for the emergency diesel generators were cumbersome. Management was taking appropriate action to improve the quality of the procedures.

7 ONSITE ENGINEERING (37551)

7.1 The following observations were made with regard to Onsite Engineering:

- There was good support from the engineering department during a followup investigation into the problem with the air start system on Emergency Diesel Generator B. However, technical support from engineering immediately after the failure was lacking. Management exhibited a conservative operating philosophy in performing single air system tests ahead of schedule.

- The emergency diesel generator system engineer was very knowledgeable and quickly concluded which components could have caused the air start system failure. The knowledge and professionalism of the system engineer supported the timely repair of the air start system.

- Engineering support during the plant downpower to repair Main Feedwater Regulating Valve B was appropriate.

- Engineering's investigation into condensation in the auxiliary feedwater pump turbine casing was appropriate.

8 FOLLOWUP - PLANT OPERATIONS (92901)

(Closed) Violation (483/9504-01)): Improper Storage of Combustible Materials in a Building Housing Safety Related Equipment

The inspectors found paint stored in the auxiliary building and a large cable reel in a cable spreading room. The licensee's corrective actions included rewriting and training plant personnel on Procedure APA-ZZ-00741, "Control of Combustible Materials," in order to clarify the combustible material control requirements. The inspectors have not noted any further problems in this area.

9 FOLLOWUP - MAINTENANCE (92902)

(Closed) Inspection Followup Item (483/9506-05): Residual Heat Removal Train B Train Mini-flow Valve EJFCV0611 Failure to Open Due to Thermal Binding

The failure's root cause evaluation was reviewed by the NRC and considered appropriate. To address the thermal binding concern, the licensee changed the valve's control scheme from torque closed to limit closed. This change reduced the final thrusts from approximately 7000 pounds when torque closed to approximately 850 pounds when limit closed at full differential pressure. Further, since this valve does not have leak tightness requirements, and since the Delta T causing the thermal binding is relatively small, the inspectors considered the licensee's actions to adequately address the concern. The licensee's actions to address pressure locking and thermal binding will be reviewed further under the guidance of Generic Letter 95-07 following Callaway's generic letter response submittal.

10 FOLLOWUP ENGINEERING (92903)

10.1 (Closed) Inspection Followup Item (483/9404-01): Containment Air Cooler Low Flows

During late 1993 and early 1994 the licensee experienced degraded Essential Service Water Train B flows to Containment Air Cooler B. The licensee found the essential service water flows to Containment Air Cooler B was, at times, less than the Technical Specification required minimum value. The primary cause was found to be blockage at the inlet to the containment air cooler. The blockage consisted mostly of plastic cooling tower fill material and other small debris. One primary concern was that the debris originated in the nonsafety-related cooling tower, which is the normal source of water to the containment air coolers during plant operation. (Following a design basis accident or loss of offsite power, the safety-related essential service water system is the source of water for the containment air coolers.)

The licensee's corrective and preventive actions included:

- Installing a screen at the clearwell outlet, which supplies water from the Missouri River to the cooling tower basin;
- Cleaning and flushing all four containment air coolers during the last refueling outage;
- Decreasing the mesh size of the screens on the suction side of the service water pumps;
- Installing a modified service water channel dam that traps debris at the service water pump suction;

- Generating a new preventive maintenance activity for postrefueling outage loose part inspections of the cooling tower basin;

- Reviewing adequacy of chemistry controls.

The licensee found that the amount of debris in the cooling tower basin during the last postrefueling outage inspection was much less than had been noted previously. In addition, the inspectors reviewed surveillance test results for the system and found no problems.

The licensee's corrective and preventive actions appear to have been effective. The inspectors concluded that the licensee conducted a thorough root cause analysis and implemented effective corrective actions.

10.2 (Closed) Inspection Followup Item (483/9504-02): Improperly Mounted Power Supply in the Main Steam and Feedwater Isolation System Cabinets

The power supply was mounted with only two of the required four screws. The licensee's followup corrective actions were to perform a formal seismic calculation design review and inspect all cabinets supplied by the same vendor. The design review determined that the components would have been operable in a seismic event. Additionally, there were no significant problems with the other cabinets' equipment mounting.

11 FOLLOWUP - PLANT SUPPORT (92904)

(Closed) Unresolved Item (483/9517-01), Valve Alignment Error During Transfer of Recycle Holdup Tank B to Boric Acid Tank B

On December 19, 1995, the licensee identified a system alignment error during transfer of the contents of Recycle Holdup Tank B to Boric Acid Tank B. Plant operators had requested the transfer to fill Boric Acid Tank B to clear a low level annunciator on the tank.

Plant procedures required that Recycle Holdup Tank B be recirculated and sampled prior to the transfer. After sampling, operators use a second procedure to realign the system to perform the transfer. In this instance, a valve alignment error occurred due to the fact that radwaste technicians had not completely secured the recirculation lineup prior to lining up to perform the transfer of Recycle Holdup Tank B to Boric Acid Tank B. As a result, some flow from Recycle Holdup Tank B was diverted to Recycle Holdup Tank A through the recirculation path.

The root cause was a combination of a procedure deficiency and personnel error. The recirculation procedure was deficient in that it did not adequately guide the individual preparing for the transfer to secure from the recirculation lineup before the transfer lineup was established. Further, the inspectors noted a human performance error when the radwaste technician did not perform a procedure step to close Recycle Evaporator Feed Pumps to Recycle

Evaporator Feed Demineralizer Isolation Valve HE8630 as required. Valve HE8630 was required to be closed at the termination of the recirculation lineup per Boron Recycle System Normal Operating Procedure RTN-HE-0010.

The licensee's corrective and preventive actions included:

- Adding steps to the recirculation procedure to explicitly state that the recirculation must be secured prior to transferring;

- Requiring a prejob briefing to enhance the coordination and communication aspects of the evolution with plant operators;

- Discussing the event in training sessions with radwaste technicians and plant operators.

This misalignment error by radwaste technicians constitutes a violation of minor significance and is being treated as a noncited violation, consistent with Section IV of the NRC Enforcement Policy. An issue of improper system alignments by plant operators was discussed in NRC Inspection Report 50-483/95-13.

12 ONSITE REVIEW OF LICENSEE EVENT REPORTS (92700)

(Closed) Licensee Event Report 94-003, Failure to Properly Perform Technical Specifications Surveillances 4.3.3.6 and 4.4.6.1.a

In June 1994, a quality assurance engineer discovered that plant operators had not properly performed checks of the containment gaseous radioactivity channels (GT-RE-31 and -32), and the containment high range radiation channels (GT-RIC-59 and -60), since receipt of the plant's operating license in June 1984. Plant operators were using nonsafety-related display instrumentation (designated as RM-11) to perform the surveillances. Operators should have used safety-related display instrumentation (designated as RM-23) to perform the channel checks.

Although the RM-23 and RM-11 perform the same function, the two indicators do not meet the same design criteria. The RM-23 is a safety-related Class 1E indicator whereas the RM-11 is not. However, the RM-11 has useful functions that the RM-23 cannot provide. For example, the RM-11 can provide trending and printouts.

Since June 1984 plant operators were unaware that the RM-23 was needed to satisfy the Technical Specification surveillance requirement. Some reasons and corrective actions were:

- Postaccident Monitoring Channel Check Surveillance Test Procedure OPS-SH-00001 allowed operators to use either the RM-11 or the RM-23 while performing channel checks of the containment high range radiation channels. The procedure was changed to allow only the use of the RM-23.

- Control Room Shift and Daily Log Readings and Channel Checks Surveillance Test Procedure OSP-ZZ-00001 allowed operators to use either the RM-11 or the RM-23 while performing channel checks of the containment gaseous radioactivity channels. The procedure was changed to allow only the use of the RM-23.

- The Technical Specifications did not specify use of the RM-11 or the RM-23 to reflect the commitments to Regulatory Guides 1.45 and 1.97 as made by the licensee in the Final Safety Analysis Report. The licensee issued a Technical Specification Interpretation which requires the use of the RM-23 during channel checks of the containment gaseous radioactivity channels and the containment high range radiation channels.

- An engineering evaluation was performed in 1989 to determine whether the containment gaseous radioactivity channels and the containment high range radiation channels were considered operable with the associated safety-related indicator module inoperable, provided that the channel was monitored on the nonsafety-related RM-11 display. That evaluation mistakenly concluded the monitors would remain operable. Responsible engineers revised the engineering evaluation to show that the RM-11 cannot be used to replace the RM-23.

The failure of the licensee to perform testing of the containment gaseous radioactivity channels and the containment high range radiation channels is a violation of Technical Specifications 4.3.3.6 and 4.4.6.1.a. This licensee-identified and corrected violation is being treated as a Noncited Violation, consistent with Section VII of the NRC Enforcement Policy.

ATTACHMENT

1 PERSONS CONTACTED

Licensee Personnel

R. D. Affolter, Manager, Callaway Plant
G. N. Belchik, Supervisor, Planning
D. T. Fitzgerald, Superintendent, Security
D. W. Griffith, Engineer, QA
G. A. Hughes, Supervising Engineer, ISEG
K. W. Kuechenmeister, Superintendent, Design Engineering
R. T. Lamb, Superintendent, Operations
J. V. Laux, Manager, Quality Assurance
R. D. Miller, Supervisor, Rad Waste
C. D. Naslund, Manager, Nuclear Engineering
D. W. Neterer. Shift Supervisor
J. R. Peevy, Manager, Emergency Preparedness and Organizational Support
G. L. Randolph, Vice President, Nuclear Operations
M. A. Reidmeyer, Engineer, Quality Assurance
T. P. Sharkey, Supervising Engineer, System Engineering

The above personnel attended the exit meeting. In addition to these personnel, the inspectors contacted other personnel during this inspection period.

2 EXIT MEETING

An exit meeting was conducted on February 8, 1996. During this meeting, the inspectors reviewed the scope and findings of the report. The licensee did not express a position on the inspection findings documented in this report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.