U.S. NUCLEAR REGULATORY COMMISSION

REGION III

REPORT NO. 50-456/95010; 50-457/95010

FACILITY
Braidwood Nuclear Plant, Units 1 and 2

License Nos. NPF-72; NPF-77

LICENSEE
Commonwealth Edison Company
Opus West III
1400 Opus Place
Downers Grove, IL 60515

DATES
July 11 through August 21, 1995

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9-19-95
Date

AREAS INSPECTED

A routine, unannounced inspection of operations, engineering, maintenance, and plant support was performed. Safety assessment and quality verification activities were routinely evaluated. Follow-up inspection was performed for non-routine events and for certain previously identified items. Special inspections were performed in the areas of Engineering and Technical Support, and Emergency Preparedness.

RESULTS

Assessment of Performance

The inspectors concluded that performance within the area of OPERATIONS was poor.

- Operations failed to meet TS action requirements for a radiation monitor failure for reasons similar to those observed for a November 1994 event which resulted in enforcement action. These reasons included the unit supervisor being distracted by other activities, and weak teamwork among shift personnel.

- Between May 31 and August 18, on five separate occasions, a waste gas oxygen instrument sample chamber isolation valve was found mispositioned closed, rendering the instrument inoperable. The repetitive nature of this problem is of concern, particularly since a root cause had not been identified and corrective actions had not prevented recurrence.

- Operations department post-maintenance valve testing was well coordinated and well conducted. Operator control of flux distribution and steam generator levels during a power transient associated with the maintenance was good.

The inspectors concluded that performance within the area of MAINTENANCE was poor.

- The results of craft skill proficiency testing indicated that the overall craft skill of the maintenance department was poor.

- Additional examples of craft skill problems and pre-service installation deficiencies were identified by the licensee and the inspectors during the period.

- A good performance-based approach was used to identify that a craft skill problem existed.

The inspectors concluded that performance within the area of ENGINEERING was poor.

- Material condition was considered to be degraded, with numerous examples of long-standing problems. Many of these problems also suffered from poor engineering evaluations; as a result, the significance of the degraded condition was not recognized.

- Test controls were determined to be weak, resulting in examples where post-modification testing could not be demonstrated, test results were rendered unreliable for trending, and instrument calibration accuracies were questionable.

- Engineering evaluations were poor, with engineers failing to recognize the safety consequences of their actions. Operability determinations were not always technically reviewed.

The inspectors concluded that performance within the area of PLANT SUPPORT was excellent.

- The overall status of the emergency preparedness program was good. Emergency response facilities and equipment were in an excellent state of operational readiness. Reviews of emergency plan activations indicated they were classified appropriately and notifications were made in a timely manner.

Summary of Open Items

Violations: Section 3.2.
Unresolved Items: Section 1.5.
Inspection Follow-Up Items: Sections 1.4, and 3.4.
Non-Cited Violations: Sections 1.2, 1.3, 3.4, 3.5, and 4.2.

INSPECTION DETAILS

1.0 OPERATIONS

NRC Inspection Procedure 71707 was used in the performance of an inspection of ongoing plant operations.

1.1 Online Maintenance on the 1A Residual Heat Removal (RHR) Pump On August 1, the licensee entered the Limiting Condition for Operation (LCO) for the 1A RHR system to perform scheduled maintenance on the pump seals, impeller and other components. Shortly after the system was taken out of service and aligned for draining, several hundred gallons of contaminated water collected on the floor of the RHR pump room and on a portion of the floor of the adjacent containment spray pump room. As a result, the RHR work was delayed about 14 hours.

Water was identified spraying out one of two vent valves opened for draining the system. The licensee's review of this condition identified that guidance was not provided to prescribe the order in which the vent valves should have been opened.

The licensee conducted an investigation and determined that the spill occurred because the floor drain in the RHR pump room was plugged with boric acid. Additional discussion of the general material condition of the floor drain system appears in Section 3.2.

The inspectors reviewed the event and concluded that because the need for cleaning out floor drains in the auxiliary building had previously been identified by plant personnel, the spill represented a weakness in job planning.

1.2 Technical Specification Action Requirement Violation On August 10, the main control room outside air intake radiation monitor for the OA train of control room ventilation alarmed indicating a low flow condition. Technical Specification (TS) 3.3.3.1 required that within 1 hour the licensee shift to the redundant train of control room ventilation or isolate the control room ventilation system and initiate operation of the control room make-up system. The unit supervisor believed that the appropriate action had already been taken because the OA ventilation train make-up system was operating as part of an unrelated activity.

After about 65 minutes, the unit supervisor realized that the recirculation charcoal absorber portion of the system was not on line as required to fully initiate make-up system operation. To correct the error, the unit supervisor immediately shifted to the redundant OB ventilation train and placed the OA charcoal absorber on line. As a result of this delayed action, the licensee did not meet TS action requirements for about 27 minutes.

The inspectors reviewed this event and determined that actions required to isolate the ventilation system were not accomplished. These actions included opening ventilation fan breakers for the control room office, operator restroom, and operator kitchen. As a result, the licensee was not in compliance with the TS requirements until the OB ventilation train was started.

In addition, the inspectors reviewed the procedure for accomplishing the LCO action requirements. The inspectors concluded that the procedure was inadequate because it did not list all actions required to isolate the ventilation system and initiate operation of the make-up system.

Inspector interviews with licensee personnel disclosed other weaknesses which included:

- The unit supervisor was distracted by other activities and did not focus adequate attention on the TS requirements until after the 1 hour time limit had expired.

- Teamwork among shift personnel was weak. Other licensed personnel on the shift failed to aid the unit supervisor to ensure that TS requirements were met.

- Technical Specifications, procedures, and training materials were unclear about what was required to isolate the ventilation system and initiate the make-up system.

10 CFR Part 50, Appendix B, Criterion V, requires that activities affecting quality be prescribed by instructions, procedures, and drawings of a type appropriate to the circumstances. The events as described above was an example where the licensee failed to meet this requirement. However, this licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII of the NRC Enforcement Policy.

1.3 Inadequate Surveillance Procedure While conducting post-maintenance testing following feedwater isolation valve repairs, operators performed 2BwOS 6.3.3-20, "Main Feedwater System Containment Isolation Valve Stroke 18 Month Surveillance." The purpose of the surveillance was to fully stroke the feedwater isolation valve.

During the surveillance, operators unsuccessfully attempted to fully close the feedwater isolation valve because the procedure did not contain steps to bypass the limit switch that prevented the valve from going more than 90 percent closed during partial stroke testing.

The inspectors observed the operators correctly diagnose the problem and revise the procedure. While the entire post-maintenance testing evolution, including the procedure revision, was carefully conducted with no imposed sense of urgency, the root problem was an inadequate procedure. The licensee's corrective actions appeared adequate.

10 CFR Part 50, Appendix B, Criterion V, requires that activities affecting quality be prescribed by procedures of a type appropriate to the circumstances. The event as described above was an example where the licensee failed to meet this requirement. However, this licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII of the NRC Enforcement Policy.

1.4 Control Room Ventilation (VC) Surveillance Failure On August 4, OB control room ventilation maintenance was completed and an operability surveillance was performed on the train. The other train was operable. During the surveillance, the positive pressure in the control room required by TS could not be obtained. The problem was partially corrected when equipment doors between the auxiliary and turbine building were opened. The leaking pressure seals in that train's damper are scheduled to be repaired at a later date.

Due to a longstanding material condition problem with auxiliary building ventilation, these doors are normally open to maintain proper differential pressure between the auxiliary building and the turbine building. During recent RHR maintenance activities, however, the doors were closed to maintain proper differential pressure between the RHR pump room and the turbine building. With the doors closed, the auxiliary building pressure was more negative than usual thus affecting the VC surveillance.

The inspectors discussed this issue with the ventilation system engineer who indicated that with the increased pressure differential between the control room and the auxiliary building due to the closed doors, leaking pressure seals prevented the required pressure in the control room from being obtained. This event will be an Inspection Follow-up Item (95010-02) pending further NRC review.

1.5 Waste Gas Valve Mispositioning Events On May 31, an operator was dispatched to investigate a low reading on the waste gas oxygen detector and found an instrument sample chamber isolation valve, OGW070, closed which rendered the instrument inoperable. This detector is used to monitor for an explosive environment in the waste gas system and is required to be operable in accordance with plant TS. No maintenance, surveillance or sampling activities were in progress. The instrument was unisolated and returned to service. On July 12, the same isolation valve was again discovered closed. The valve was re-opened and the instrument was returned to service. No root cause could be identified. On August 7, the event repeated itself a third time. As part of the licensee's corrective actions for this event, a caution card was generated to require shift engineer approval prior to operation of the valve. On August 17, an IMD technician found the valve closed. On August 18, following an IMD surveillance, the valve was found closed a fifth time. As part of the licensee's corrective actions for this fifth occurrence, the entry door to the waste gas compressor room was locked to significantly restrict access to this valve.

During each of these events, the licensee entered the appropriate LCO and complied with the action requirements. The repetitive nature of this problem is of concern and is considered an unresolved Item (95010-03) pending further review. The results of the licensee's investigation will be reviewed during a future inspection.

1.6 Power Reduction for Feedwater Isolation Valve Repair On August 5, operators ramped unit 2 down to 30 percent to perform a feedwater isolation valve repair. Following the repair, the licensee conducted post-maintenance testing to demonstrate valve operability and then ramped power back to 100 percent.

The inspectors observed the post-maintenance valve testing and portions of the power changes. Overall, the testing was well coordinated and well conducted. Operator control of flux distribution and steam generator levels during the large power transient was good. One procedural problem encountered is discussed in Section 1.3.

1.7 Follow-up on Previously Opened Items NRC Inspection Procedure 92903 was used to perform a review of previously opened items.

(Closed) Inspection Follow-up Item 95008-01: Leak from spent fuel pool filter. On May 30, about 3000 gallons of water was inadvertently drained from the spent fuel pool after the spent fuel pool skimmer filter was returned to service following a routine filter change.

The licensee's investigation indicated that a metal plate used to ensure the filter housing was water-tight was not properly installed. One of four bolts for securing the plate was found to be stuck, due to corrosion, in the drive tube extension used to turn the bolt. This allowed some thread engagement, but not enough to prevent leakage of the spent fuel pool water out of the housing.

The source of the water that caused the corrosion was unknown, but was suspected to have entered the housing when health physics personnel left survey ports on the housing open for an extended time.

Corrective actions for this isolated event were good and included repair of the assembly, revision of the filter change out procedure to ensure thorough inspection of the tube and bolt drive assemblies, and instruction to health physics personnel to ensure timely closure of survey ports.

2.0 MAINTENANCE

NRC Inspection Procedures 62703 and 61726 were used to perform an inspection of maintenance and testing activities.

2.1 Rod Control System Malfunction On August 4, while conducting a monthly control rod surveillance, shutdown bank "E" rods were inserted 10 steps but failed to withdraw. Technical Specifications required that the rods be fully withdrawn within 1 hour or that the reactor be shut down. The

licensee conducted troubleshooting and identified a problem with a rod withdrawal relay. The relay was replaced and the rods were withdrawn.

The inspectors observed the troubleshooting and repair efforts and noted that the efforts were well controlled. Operators and maintenance workers made conservative decisions and worked carefully without an undue sense of urgency despite time limitations.

2.2 Material Condition In inspection report 95009, the inspectors identified that the material condition of the hypochlorite injection system was poor. During this period, a flange, which had been identified as leaking, failed. This resulted in hypochlorite solution spraying over a large area until discovered and isolated by the licensee. The inspectors concluded that this event was due to a degrading material condition of the sodium hypochlorite system which had not been corrected.

2.3 Good Use of Wrong Unit Event for Training On August 9, the licensee identified that during the performance of a unit 1 fire detector surveillance, two electricians inadvertently tested a unit 2 smoke detector.

Although the event had minimal safety significance, the licensee used it for training and took several actions to emphasis the lessons learned. These actions included a discussion of the event with all maintenance groups and senior management, and documentation of the event in the station newsletter. The inspectors concluded that the actions were proactive and comprehensive.

2.4 Follow-up on Previously Opened Items A review of previously opened items (violations, unresolved items, and inspection follow-up items) was performed per NRC Inspection Procedure 92902.

(Open) Inspection Follow-up Item 95009-03: Preservice Installation Deficiencies. Previous inspection reports have discussed numerous deficiencies that appeared to have been in place since original plant construction, but had not been identified by the licensee in a timely manner. During this inspection period, additional examples were identified by both the inspectors and the licensee.

- Expansion Joint Tie Rods Missing on the 2A Emergency Diesel Generator (EDG) On July 27, the inspectors identified that tie rods on an expansion joint on the 2A EDG lube oil pump discharge line were not installed. Tie rods were installed on the expansion joints on the other three EDGs.

The licensee contacted the vendor who indicated that the rods were installed to limit the thrust load on the discharge piping downstream of the expansion joint during startup of the lube oil pump. The licensee also contacted the Byron licensee who determined that the tie rods were missing from all four of their EDGs. Subsequent information indicated

that the problem was widespread and tie rods were discovered missing from EDGs at numerous plants. The regional staff is currently working with the headquarters staff to ensure the generic aspects of this finding is communicated to the industry. Also, the vendor (Cooper-Bessemer) has notified the other utilities.

The licensee conducted a preliminary operability determination and concluded that operability requirements were met. A final operability determination was to be completed by September 8, 1995. The results of the licensee's investigation will be reviewed at a future date. This is an Inspection Follow-up Item (95010-04) pending a review of the final operability determination.

- Posi-Seal Trunnion Valves Installed Backwards On July 28, the inspectors identified that a suction valve on a circulating water vacuum priming pump appeared to be installed backwards. On August 8, the inspectors identified an additional Posi-Seal Trunnion Valve, in an essential service water strainer backflush line, also installed backwards. The licensee conducted an investigation which confirmed the problem. In addition, the licensee determined that suction valves on the mechanical vacuum pumps were also installed backwards. These are not safety significant but indicate a lack of careful system walkdowns by operations and engineering disciplines.

- Conduit Seals in Fire Protection System Were Missing On August 8, the inspectors identified several missing seal plugs in unused conduit holes on Jamesbury isolation valves in the carbon dioxide fire protection system although the nameplates on the valves described them as splashproof.

- Bent Sag Rods On July 24 and August 15, the inspectors identified several excessively bent sag rods (structural supports designed to limit twisting motion of lateral I-beams) in the Unit 1 and Unit 2 condensate pump ventilation fan rooms. This could lead to structural failure of the beams.

The inspectors concluded that recent licensee walkdowns of all systems to identify material condition problems had not been totally effective and indicate the need for reemphasis of management's expectations.

2.5 Follow-Up on Previously Opened Items NRC Inspection Procedure 92902 was used to perform a review of previously opened items. The following item was closed.

(Closed) Inspection Follow-up Item 95009-02: Craft Skill Weaknesses. The licensee completed craft skill proficiency testing covering a variety of areas. These areas included valve packing installation, hydraulic wrench operation, equipment rigging, bus grounding, motor bearing removal and installation, limitorque operator troubleshooting, and thermal overload setting.

The inspectors assessed the licensee's approach to address the craft skill concern and concluded that the method was good for two reasons. First, a performance-based approach was used to measure the on-the-job ability of maintenance workers to perform routine tasks. Second, the criteria used to measure performance success was challenging.

3.0 ENGINEERING

NRC Inspection Procedures 37550 and 37551 were used to perform an onsite inspection of the engineering function.

3.1 Control of Constant Level Oiler Settings Was Poor The inspectors identified numerous constant level oilers on pumps, motors, and gear boxes that appeared to be set improperly. Most significant were oilers on component cooling water and fuel pool cooling pumps. Other examples included the auxiliary building borated equipment drain tank pump, clearwell transfer pumps, regeneration pumps, and hot water circulation pumps.

For the fuel pool cooling pumps, the licensee was aware the oilers were set too high, but because of the piping arrangement, could not be lowered without a modification. Standard maintenance procedure SMP-M-01, "Constant Level Oilers & Sightglasses," indicated that if oil level is set too high, the oil splashes, foams, and seeps out along the shaft, wasting oil and deteriorating motor windings. In addition, one of the fuel pool cooling pumps was caution tagged to indicate a severe oil leak which required that the reservoir be filled more than once a shift.

The inspectors also noted that on many of the motors there was no external indication of what the oil level should be. Therefore, it was not possible to determine if the oilers were set properly. The inspectors also identified several oilers with missing set screws and level adjusting arms.

Overall the inspectors concluded that the licensee's procedure for control and adjustment of constant level oilers was good, however, actual implementation of the program was poor.

3.2 Control of Leak Detection Sumps and Floor Drains During this inspection period both the licensee and the inspectors identified several conditions which indicated that control of leak detection sumps and floor drains was poor.

- In June 1995, the licensee inspected the leak detection sumps and noted numerous material condition problems such as broken or plugged weir walls and excessive debris in the sumps or drain screens.

- In July 1995, the inspectors raised concerns regarding an excessive amount of rags, plastic bags, laundry bags, and other uncontrolled material which could plug floor drains in safety-related systems.

On August 1, while draining the 1A RHR system in preparation for maintenance, water backed up in a plugged floor drain in the RHR pump room and overflowed into the 1A containment spray pump room. The plugging was caused by solidified boron in the drain line. A similar situation was later found in the 1B, 2A, and 2B RH room sump drains.

The inspectors reviewed this event and determined that the licensee had no program for testing the operation of the leak detection sumps or floor drain systems in either safety- or nonsafety-related rooms. Drain screens in some drains were cleaned annually but drains were not verified to be free flowing. In addition, the cleaning surveillance did not include the safety-related sump drains.

The Updated Safety Analysis Report, in describing the floor drain system, stated that "credit is taken for the floor drain capacity since there is no potential failure mode for the auxiliary building drain pipes which would prevent drainage."

Due to the poor material condition of the leak detection sumps and floor drains, weak controls over loose material near the drains, lack of an effective program to inspect and test the system, and the events described above, the inspectors concluded that the floor drain design basis as described above was not satisfied.

10 CFR Part 50 Appendix B, Criterion XVI requires that conditions adverse to quality be promptly identified and corrected. Failure to promptly correct a longstanding problem with the floor drain system is a violation (50-456/95010-01;50-457/95010-01).

3.3 Material Condition The inspectors identified numerous issues that indicated that material condition was degrading. These issues included:

- Essential Service Water Seismic Restraints During a walkdown of the 2A emergency diesel generator (EDG), the inspectors identified that the base plate of a rigid restraint on the essential service water (SX) system had separated from the wall. The following day, while observing a routine EDG surveillance, the inspectors heard a loud noise and observed SX piping visibly moving, indicating that a water hammer had occurred.

  The licensee performed a detailed walkdown of the other diesel generator rooms, and identified additional water hammer induced conditions such as rotated pipe clamps, a cracked block wall between the 1A and 1B EDG rooms, a damaged fire seal, and piping support problems.

  The licensee performed an operability assessment and concluded that the system was operable. In addition, special testing indicated that the root cause was probably due to the fast opening of an SX valve which supplies the diesel jacket water coolers. The licensee also conducted a special training session for the system engineers to alert them to potential restraint problems

during system walkdowns. A follow-up training session for operations personnel was planned.

As part of their immediate corrective actions, th separated restraint was properly secured to the wall and the broken wire seal was temporarily repaired. The licensee was considering potential operational and hardware changes to resolve the concern, as well as pursuing permanent correction of the other physical deficiencies identified.

The inspectors concluded that the licensee had a high threshold for reporting problems as evidenced by the failure to report the water hammer noise and pipe movement until identified by the inspectors. The actions taken by the licensee, once the problem was identified, were acceptable.

Pressurizer Power Operated Relief Valve (PORV) O-Ring Failures

The inspectors reviewed PORV accumulator check valve test records and found that on January 29, 1995, a test was conducted on the check valve due to a low accumulator pressure. The test failed due to leakage past the check valve o-ring seat. On January 30, following replacement of the o-ring with a like-for-like component, the test failed again. This time the failure was traced to a missing lock-wire on the PORV accumulator relief valve, which allowed the relief valve to come off its closed seat.

The inspectors then reviewed records of previous tests and found that in April 1991, the test failed and the check valve o-ring was replaced. The system was next tested in October 1992, it failed, and the o-ring was replaced. The next test in April 1994 passed. However, the check valve test failed in January 1995 as described above.

In discussions with the system engineer, the inspectors learned that the check valve o-ring design was questionable in both these and other similar check valves installed in the plant. The licensee planned to check the condition of the o-ring during the next refueling outage.

The inspectors also questioned the material condition of the pressure regulator because the previous testing indicated that the initial accumulator pressures were in excess of the pressure regulator set pressure. In some cases, the inspectors found that the licensee had throttled open a normally closed downstream bleed-off valve in an effort to reduce the accumulator pressure prior to performing the check valve testing. Additionally, the inspectors noted that during the inspection, the licensee adjusted the regulator because the accumulator pressure exceeded the high alarm setpoint.

The inspectors concluded that the overall material condition of the PORV air system was poor.

- Boron Crystal Buildup on Safety-Related Components During a walkdown of the containment spray (CS) system, a 14-inch motor-operated valve, 2CS001B, was observed with large boric acid crystal deposits at the body-to-bonnet connection around the carbon steel bolts and nuts. The inspectors reviewed work history records and determined that the valve was retorqued three times since the leakage was first observed in 1987. However, these attempts were unsuccessful in isolating the leakage.

  The inspectors noted that numerous other safety-related valves and pumps had evidence of boric acid leakage. The inspectors were concerned about the long term effects of boric acid on carbon steel components (Section 3.5).

  The inspectors also noted a longterm degraded condition on the 2B residual heat removal (RHR) pump, which also had a recurrent boric acid leak (Section 3.5).

  The inspectors concluded that the licensee's program to identify and control boric acid leakage was poor.

- SX Throttle Valve Binding The inspectors walked down portions of the essential service water system including the cubicle cooler throttle valves. As-found positions for three of the 10 valves observed could not be determined because the valves became mechanically bound before they could be fully closed. The inspectors concluded that the overall material condition of these valves was poor.

- Battery Exhaust Fan The inspectors identified that the battery 211 exhaust fan had a history of tripping on high differential pressure over a several month period. The degraded material condition of the fan, and the licensee's actions in response to this condition, were the subject of a special inspection (50-456/95011;50-457/95011).

- EDG Lube Oil and Fuel Oil Leaks The inspectors observed multiple lube oil leaks on all four EDGs, and a fuel oil leak on the 1B EDG. The volume of the lube oil leak on the 1B EDG was so large that a bucket was required to catch the leakage. The licensee did not have any calculation to demonstrate the leak would not affect operability. In addition, an action request (AR) tag was affixed to the 1B EDG without any name or date. The licensee was unable to find evidence that the deficiency had been entered into the work control system. Once identified by the NRC, the licensee took prompt action to evaluate both these conditions.
  The inspectors concluded that the examples described above represented a significant weakness in the licensee's ability to identify and address material condition problems.

- Auxiliary Building Ventilation The inspectors reviewed a longstanding auxiliary building ventilation material condition problem in conjunction with the response to Violation 50-456/93022-01;50-457/93022-01. Additional discussion appears in Section 3.8.

- Temporary Alterations The inspectors identified a poor practice of using the temporary alteration process to address material condition problems. Examples included:

  - In March 1990, the thermal barrier heat exchanger for the 2B reactor coolant pump (RCP) was damaged during a cavitation event, resulting in elevated bearing water temperatures. A temporary alteration was installed in October 1991 to monitor bearing water temperature and the data was provided to Westinghouse for evaluation. This evaluation indicated that the pump was degraded, but operable, and that the thermal barrier should be replaced in a future outage. The evaluation also indicated that in the event of a loss of seal injection flow, pump operation limits would be exceeded after about 27 minutes which would require the pump to be secured and the plant to be shutdown to avoid an RCP seal failure. Since the temporary alteration was installed, the modification to replace the thermal barrier was canceled. As of the end of the inspection, the licensee had not determined what corrective actions associated with the degraded thermal barrier should be implemented.

  - During a surveillance, the licensee determined that the 2A auxiliary feedwater (AFW) pump oil cooler was not receiving sufficient cooling water flow due to an SX outlet valve not opening completely. A temporary alteration was installed to remove the valve internals rather than repair it, resulting in the oil cooler receiving continuous cooling, a condition for which it was not designed. The licensee planned to either remove the temporary alteration or evaluate its acceptability prior to cold weather conditions.

- Ground Water Inleakage into the Auxiliary Building During a walkdown of the RHR and CS pump rooms, the inspectors observed ground water inleakage from the walls at numerous locations. The licensee had injected sealants to stop the inleakage, however, these attempts were unsuccessful.

  The inspectors reviewed this issue and concluded that safety-related support base plate anchors could be adversely affected. Water inleakage at or near a support could result in concrete deterioration and surface swell, and the sealant injection holes surrounding the base plate could weaken the concrete where the expansion anchor bolts were installed.

- Station Air Compressor Carbon Monoxide (CO) Analyzer During an inspection of the Station Air (SA) system, the inspectors identified that the CO analyzers were inoperable four times in 1994 and 1995 for various reasons. Breakdowns also occurred in 1987, 1989, and 1990. Despite the worsening equipment operability trend, the system engineer did not report the problem to management for resolution. The inspectors concluded that the licensee's response to the degrading performance of the CO analyzer system was poor.

3.4 Test Control

The inspectors identified several testing deficiencies which indicated that the overall test control program was poor. Examples included:

- Post Modification Testing Two examples of inadequate post modification tests were identified by the inspectors. In the first, a required hydrostatic test was not performed following a temporary alteration to seal weld a primary valve.

  In a second example, operational testing performed for an exempt change to replace a Kerotest valve with an Anchor Darling valve did not meet the requirements specified in the approved exempt change document. The approved exempt change required that the valve be manually stroked open and closed to verify that the valve did not bind. However, only a partial stroke was performed which did not provide assurance that the valve would operate without binding over its entire range.

  The licensee was able to demonstrate that both examples had only minor safety impact. 10 CFR Part 50, Appendix B, Criterion XI, requires, in part, that testing be performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. The events as described above was an example where the licensee failed to meet this requirement. However, this violation was of minor significance and is being treated as a Non-Cited Violation, consistent with Section IV of the NRC Enforcement Policy.

- Essential Service Water Cubicle Cooler Testing As discussed in inspection report 95009, the 1B essential service water cubicle cooler was about 65 percent plugged with clams and silt.

  The inspectors reviewed the licensee's testing program and determined that the licensee chose to test cubicle coolers in lieu of inspection, as allowed by Generic Letter (GL) 89-13. Three sets of GL 89-13 tests were completed on all cubicle coolers. However, the results of those tests were widely scattered and, in some cases, unexpected. For example, the 2A CS cubicle cooler heat capacity appeared to be on a steadily improving trend, while the 1B centrifugal charging pump cubicle cooler heat capacity decreased considerably after cleaning.

Based on the wide scatter in the test data and the significant clogging found on the 1B SX cubicle cooler, the licensee decided to test all cubicle coolers to obtain a fourth data point. In addition, the licensee planned to clean cubicle coolers in the future dependent upon work window availability.

The inspectors reviewed the licensee's testing method and concluded that the results appeared to be strongly dependant upon initial plant conditions, particularly SX inlet water temperatures. The licensee believed that the difficulty arose from their conservative accounting of instrumentation errors which resulted in a large error band. The licensee planned to review the test procedures to determine if there was a better method to obtain input data and narrow the error band.

Additionally, the inspectors noted that the calculation did not account for flow instrument error. This discrepancy was pointed out to the licensee, who also planned to review the impact that flow instrumentation errors would have upon the calculation.

The inspectors concluded that the licensee's GL 89-13 program was adequate, and that no operability concerns existed.

Vibration Instrument Accuracy The inspectors reviewed a vibration surveillance procedure for the 2B containment spray pump and the vibration measuring instrument calibration records. The following errors were identified:

The surveillance procedure specified use of one vibration indicating meter with an accuracy of 5 percent, consistent with Section XI of the ASME Code. However, the surveillance actually used a vibration indicator with a separate accelerometer attached to the meter. Discussions with licensee personnel revealed that the two instruments were calibrated separately.

The inspectors determined that the calibration program required that the accelerometer accuracy be within 3.5 percent, and the digital meter accuracy be within 4 percent. Because the resulting total system accuracy could be as high as 5.31 percent, which was greater than the ASME Code limit of 5.0 percent, the inspectors concluded that a program error existed. When brought to the licensee's attention, they checked the actual accuracies of all the instruments used in the last 2 years and determined that they were always calibrated within 5 percent in combination and therefore ASME Code requirements were met.

In response to the inspectors identification of the error, the following corrective actions were initiated:

- Reduction of the Digital meter accuracy requirements ensure combined system accuracy within 5 percent.

- Revision of the surveillance procedure to require the combined system accuracy to be within ASME Code requirements.

- Revision of the digital meter specification sheet to add an accuracy requirement for the accelerometer.

10 CFR Part 50, Appendix B, Criterion V, requires that activities affecting quality be prescribed by procedures of a type appropriate to the circumstances. The event as described above was an example where the licensee failed to meet this requirement. However, this violation was of minor significance and is being treated as a Non-Cited Violation, consistent with Section IV of the NRC Enforcement Policy.

- PORV Accumulator Check Valve Testing During an inspection at Byron in May 1994, the NRC identified a questionable PORV accumulator check valve leak test methodology. The test procedure required personnel to blow down the PORV accumulator and repressurize the tank before performing the test. This methodology resulted in the check valve lifting and reseating, potentially cleansing the seating surface and affecting the test results. The Braidwood surveillance procedure was revised in October 1994 to eliminate this practice.

  The inspectors reviewed the revised procedure as well as recent test results and identified that although the revised test procedure no longer directed complete blow down of the accumulator prior to testing the check valve, it did permit partial blow down of the accumulator to ensure the test initial conditions were met. Depending on how the blow down was performed, the check valve could still be exercised, raising the same concerns as with the earlier procedure revision. This is an Inspection Follow-up Item (95010-05) pending further review.

3.5 Engineering Evaluations and Configuration Control

The inspectors reviewed numerous site engineering and system engineering evaluations, including temporary alterations and operability determinations. The inspectors concluded that, overall, engineering evaluations were poor. Additionally, one example of poor configuration control was identified.

- Battery Room Ventilation During a system walkdown, the inspectors identified a temporary fan installed on a fire damper for the battery 211 room. This temporary fan was not evaluated under the temporary alteration program, and the effect on battery operability was not evaluated until identified as a concern by the inspectors. This issue is discussed in special inspection report 95011.

- Boric Acid Attack on Carbon and Low-Alloy Steel Due to a degraded material condition found on the containment spray suction valve discussed in Section 3.3, the inspectors reviewed the licensee's actions in response to boric acid leaks on carbon and low-alloy steel bolts and nuts. The inspectors determined that the program was limited to a visual inspection of bolt and nut surfaces. The inspectors considered this program to be ineffective because the highly stressed threading areas were not visible for inspection. The licensee planned to perform a more aggressive inspection, including removal and inspection of the bolts.

- Torquing of 18 of 24 Bolts on the 2B RHR Pump During a system walkdown, the inspectors observed heavy boric acid crystal deposits on the 2B RHR pump motor-to-body flange. The inspectors reviewed the work history of the valve and determined that the pump began leaking in 1988. Since that time, six work requests were written to retorque the flange bolts; however, five of those work requests were canceled without any written justification.

  One work request was completed in December 1992. On that work request, the maintenance crew could not reach 6 of the 24 bolts due to equipment interference. Maintenance reported the situation to system engineering and received authorization to proceed with retorquing only the 18 accessible bolts. This failed to stop the leak.

  The inspectors requested the engineering evaluation which authorized the work. The licensee stated that the decision was based upon a telephone conversation with the pump vendor, and no documentation of the engineering evaluation was generated.

  The inspectors concluded that the engineering evaluation was poor because it failed to consider gasket compression effects and potential overloading of the 18 retorqued bolts. Consequently, the inspectors considered the leaking 2B RHR pump a longstanding material condition problem with poor corrective actions.

- Condensate Header The inspectors reviewed an exempt change in which reinforcement pads were installed at the condensate pump discharge header branch connections. The inspectors noted that a leak was first observed on one branch connection in 1987, and a pad was installed. A second leak occurred in 1993, which prompted the exempt change. The inspectors identified the following issues:

  - There were additional header branch connections without any reinforcement pads. Even though the licensee conducted visual inspection of these connections, any defects other than through-wall cracks or surface cracks would not have been identified.

- The installation of reinforcement pads on the header changed the overall piping stress on the system. However, the original piping stress analysis was not amended.

- During a walkdown of the piping, the inspectors observed that the as-built piping configuration did not agree with the approved piping diagrams. The licensee stated that these errors would be corrected.

The inspectors concluded that the engineering evaluation of this issue was poor.

- Temporary Alterations The inspectors reviewed existing temporary alterations and concluded that a number of them have been installed for a duration significantly exceeding the original estimation. Also, there appeared to be a number of temporary alterations that should have been implemented as permanent plant modifications or exempt changes.

For example, a modification to the stator water cooling system was installed using a temporary alteration due to timeliness concerns. Concurrently, the licensee initiated an exempt change to make this a permanent modification to the facility. However, this exempt change had yet to be completed two and a half years later.

Based on this event as well as licensee interviews, the inspectors concluded that the temporary alteration process was often used to circumvent the formal modification process due to it being untimely.

- Operability Determinations The inspectors reviewed selected operability determinations and concluded that some determinations lacked rigor and that, in one case, the need to perform an operability determination was not recognized.

Operability determinations performed for the 2A RHR and 1B SX room cubicle coolers were not technically reviewed as required by NEP-12-02, "Preparation, Review, and Approval of Calculations."

In addition, the inspectors were concerned that the licensee assumed a linear degradation of these heat exchangers using three previous test data points with significant data scatter to project heat exchangers operability. In the case of the 1B SX cooler, a subsequent data point was obtained which indicated that the heat exchanger was significantly degraded. The licensee failed to reconcile the difference in expected performance with the data obtained; instead, the licensee revised the operability determination using the same methodology to reflect the new data point.

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At the end of the inspection, the inspectors did not have an immediate operability concern with these heat exchangers because the licensee had cleaned both of them.

10 CFR Part 50, Appendix B, Criterion V, requires that activities affecting quality be prescribed by procedures of a type appropriate to the circumstances and be accomplished in accordance with those procedures. Failure to perform a technical review as required by NEP-12-02 is an example where this requirement was not met. However, this violation was of minor significance and is being treated as a Non-Cited Violation, consistent with Section IV of the NRC Enforcement Policy.

3.6 Modifications

The inspectors reviewed exempt changes, minor modifications, and major modifications, including the 125V station battery replacement, the RCS bypass line elimination, and the AFW pump auto-start circuitry revision.

The inspectors did not identify any problems with these modifications. The 10 CFR 50.59 safety evaluations and the calculations associated with the modifications were good.

3.7 Self-Assessment

The inspectors reviewed recent audits and reports by the independent safety review group (ISEG) and site quality verification (SQV) audit group pertaining to engineering. The inspectors also discussed the engineering program with the ISEG and SQV supervisors. The reports and audits, although very limited in scope, appeared to reach good conclusions and the findings and recommendations were appropriate. However, overall, the licensee's ability to find its own problem is limited based on the numerous NRC findings identified in this inspection report.

the walk-through process. The inspectors conducted a review of procedures and held discussions with the Emergency Operating Procedure coordinator, and identified that the procedure for loss of residual heat removal cooling had numerous outstanding minor deficiencies and written suggestions for enhancement that had not been addressed. The EOP coordinator indicated that a revision of the procedure to incorporate the deficiencies and suggestions was a high priority item. There was no comparable backlog for other abnormal operating procedures. This item is closed.

(Closed) Inspection Follow-Up Item 95009-05: Material Condition of the SX Cubicle Coolers. This issue is discussed in Section 3.5.

(Closed) Inspection Follow-Up Item 95009-06: 1B SX Cubicle Cooler Operability Determination. This issue is discussed in Section 3.5.

(Open) Violation 93022-01: Inadequate Corrective Actions to Correct Fire Door Impairment. Although the violation was issued in January 1994, the fire door between the auxiliary and turbine buildings was not closed until August 25, 1994, at which time the auxiliary building ventilation system was returned to four fan operation – two supply and two exhaust fans. (The ventilation system design problem was the underlying issue behind the fire door being impaired). On September 4, 1994, the "B" exhaust fan failed due to a foreign material exclusion problem. About two months later, the "A" exhaust fan catastrophically failed. As a result, the licensee returned to two fan operation and reopened the fire door to reduce the differential pressure between the auxiliary and turbine buildings.

In March 1995, the licensee recognized that the established priority to correct the underlying issue was not appropriate. At that time a consultant was hired to investigate the exhaust fan failures. A root cause evaluation report was issued on August 2. A meeting to determine the corrective actions was scheduled for later that month.

The inspectors were concerned that the fire door was still impaired and that the corrective actions, as of the time of the inspection, were not adequate to resolve this longstanding concern. This item remains open pending review of the licensee's actions to correct both the underlying ventilation design problem as well as the fire door impairment.

4.0 PLANT SUPPORT

NRC Inspection Procedures 71750, 83750, and 82701 were used to perform an inspection of Plant Support activities.

4.1 Operational Status of the Emergency Preparedness (EP) Program

4.1.1 Actual Emergency Plan Activations Six Unusual Events (UE) had been declared since February 1994. Records reviewed indicated that classifications and notifications to State, county, and NRC, had been made properly and in a timely manner. Records for each event were

detailed and technically correct. The event critiques included minor problems and indicated that appropriate and timely corrective actions were taken for these items.

4.1.2 Emergency Response Facilities, Equipment, Instrumentation, and Supplies Tours of the emergency response facilities were conducted. The inspectors concluded that each facility was well maintained and in an excellent state of operational readiness. Communications links, dose assessment hardware and software, and other necessary items were functional. Adequate supplies and procedures were available for all facilities.

4.1.3 Organization and Management Control A new EP Coordinator (EPC) and trainer were in place since the February 1994 routine inspection. The excellent condition of the emergency facilities, equipment, training records, as well as interviews with key emergency response personnel indicated an improving trend in the EP program and training. Discussions with EP personnel and key emergency response personnel indicated appropriate management support had been provided for the program.

4.1.4 Training Records indicated that drills and exercises were formally critiqued and that appropriate items were selected for corrective action.

The inspectors observed effective training of a new Environs Director for the Technical Support Center. This training included hands-on training in the facility and with emergency procedures. A written examination and formal critique were also provided as part of the training.

The results of the interviews with three key emergency response persons to verify knowledge of procedures, emergency actions and responsibilities, and knowledge of changes to the program and procedures, were very good. An interview with the Station Director indicated that training regarding NRC and other federal agency incident response had been provided.

4.1.5 Audits and Surveillances 1994 and 1995 EP Audits were reviewed by the inspectors and found to adequately meet the requirements of 10 CFR 50.54(t) with respect to scope and assessment of effectiveness of licensee's interface with State and local agencies. Station Quality Verification (SQV) staff and the EPC were responsive in obtaining select 1994 audit items to satisfy the 10 CFR 50.54(t) requirements. Audit findings identified that State and local interface was satisfactory.

An "Emergency Preparedness Peer Review" provided a good self assessment of the program. Peer Review recommendations included having personnel in addition to the EPC review the callout list; to review the Administrative Course Management Information (ACMI) for compliance issues; to revise the ACMI to make it a more effective tool for EP training; to tab the emergency response facilities (ERFs) managers'

working documents; to remove all phone numbers from procedures and place in the ERF Phone Directory; and to revise the implementing procedures to include the Safe Shutdown Crew concept. At the end of the inspection, EP personnel were evaluating the recommendations to determine what actions were to be taken.

4.1.6 Communications Capabilities Related to The Turkey Point Hurricane Information In response to the Turkey Point hurricane, the inspectors reviewed the licensee's primary and backup communications methods to determine if 10 CFR Part 50, Appendix E requirements were met.

The inspectors determined that the primary means of notification to offsite agencies was through the dedicated Nuclear Accident Reporting System (NARS). In addition, backup communications capabilities included commercial phones, a microwave link to the load dispatcher, private cellular phones, and the Federal Telephone System (FTS). Also, Security could communicate with the three local county sheriffs by radio. The inspectors concluded that all regulatory requirements were being met.

4.2 Fire Protection

On August 10, the inspectors identified a fire door propped open without a Plant Barrier Impairment (PBI) tag or personnel in attendance of the door as required by BwAP 1110-3, "Plant Barrier Impairment Program." Interviews with licensee personnel indicated that due to a miscommunication between maintenance and the Fire Marshall, work groups believed a PBI was not required. The failure to obtain a PBI as required is a violation. However, the violation was of minor significance and is being treated as a Non-Cited Violation, consistent with Section IV of the NRC Enforcement Policy.

4.3 Follow-up on Previously Opened Items NRC Inspection Procedure 92904 was used to perform follow-up inspection of the following items:

4.3.1 (Closed) Violation 94006-01: During the December 2, 1993, emergency plan activation, an Unusual Event was declared due to a loss of station communications, but the NRC was not notified of the Unusual Event declaration. Review of the last six actual emergency plan activations demonstrated the appropriate notification of the NRC for each Unusual Event declared. This item is closed.

4.3.2 (Closed) Violation 94006-02: Required annual EP training requalification examinations were not being written, approved, or administered as required. Discussions with EP training staff and review of EP requalification examinations identified that written examinations had been provided for all station EP training, after February 1994. Also, the ACMI was revised to allow for other than written examinations for EP requalification training. This item is closed.

4.3.3 (Closed) Violation 94006-03: Between January 1, 1993 and February 18, 1994, formal critiques had not been provided after EP training, including exercises, as required by 10 CFR Part 50, Appendix E.

Discussions with training staff and review of 1994 and 1995 training records indicated that formal critiques had been provided after all training, including exercises.

4.3.4 (Closed) Inspection Follow-up Item 93015-01: During the Braidwood 1993 annual exercise, the Corporate Emergency Operations Facility (CEOF) failed to issue a Nuclear Accident Report System (NARS) form to the offsite authorities for a windshift and was late providing a State Agencies Updates Checklist (SAUC) to the offsite agencies. Discussions with Corporate and plant EP staff for corrective actions indicated that the SAUC and NARS procedures have been revised, group discussions and corporate training have been provided, and performance has been demonstrated for these items. This item is closed.

4.3.5 (Open) Inspection Follow-up Item 94003-01: During the Braidwood 1994 annual exercise, the control room crew failed to properly implement Emergency Operating Procedures (EOPs). This item will remain open pending successful demonstration of the control room crew to properly implement the EOPs.

4.3.6 (Open) Exercise Weakness 94003-02: During the Braidwood 1994 annual exercise, several examples in which the Operational Support Center (OSC) did not adequately provide internal exposure control protection or contamination control were identified. An example was appropriate protective equipment was not assigned to OSC response teams. This item will remain open pending successful demonstration of appropriate OSC internal exposure control protection and contamination control.

4.3.7 (Open) Inspection Follow-up Item 94003-03: During the Braidwood 1994 annual exercise, the OSC failed to properly conduct contamination control at the facility. An example was personnel traversed the step off pad without frisking. This item will remain open pending successful demonstration of proper radiological controls at the OSC.

4.3.8 (Open) Inspection Follow-up Item 94003-04: During the Braidwood 1994 annual exercise, the Technical Support Center (TSC) staff, Emergency Operations Facility (EOF) staff, and other personnel failed to keep the CEOF personnel informed of key decisions of emergency response. Examples of key decisions included the transfer of command and control from the TSC to the EOF, the declaration of General Emergency, and protective actions taken by the State. This item will remain open pending successful demonstration of informing the CEOF in a timely manner of the status of key emergency response decisions.

5.0 PERSONS CONTACTED AND MANAGEMENT MEETINGS

The inspectors contacted various licensee operations, maintenance, engineering, and plant support personnel throughout the inspection period. Senior personnel are listed below.

At the conclusion of the inspection on August 21, 1995, the inspectors met with licensee representatives (denoted by *) and summarized the scope and

findings of the inspection activities. The licensee did not identify any of the documents or processes reviewed by the inspectors as proprietary.

K. Kaup, Site Vice President
*T. Tulon, Station Manager
A. Haeger, Executive Assistant
*W. McCue, Support Services Director
*R. Flessner, Site Quality Verification Director
*G. Groth, Maintenance Superintendent
*D. Skoza, Engineering Superintendent
*R. Byers, Work Control Superintendent
*D. Miller, Technical Services Superintendent
K. Bartes, Regulatory Assurance Supervisor
A. Checca, System Engineer Supervisor
*R. Kerr, Engineering and Construction Manager
*D. Cooper, Operations Manager
*J. Lewand, Regulatory Assurance - NRC Coordinator

6.0 VIOLATIONS FOR WHICH A "NOTICE OF VIOLATION" WILL NOT BE ISSUED

The NRC uses the Notice of Violation as a standard method for formalizing the existence of a violation of a legally binding requirement. However, because the NRC wants to encourage and support licensee's initiatives for self-identification and correction of problems, the NRC will not generally issue a Notice of Violation for a Severity Level IV violations that meet the tests of the NRC Enforcement Policy (NUREG 1600) Section VII. These tests are: 1) the violation was identified by the licensee; 2) the violation will be corrected, including measures to prevent recurrence, within a reasonable time period; 3) the violation was not willful and 4) it was not a violation that could reasonably be expected to have been prevented by the licensee's corrective action for a previous violation. In addition, in accordance with the provisions of Section IV of the Enforcement Policy, Notices of Violation will not be issued for violations of minor safety significance. Violations of regulatory requirements identified during this inspection for which a Notice of Violation will not be issued are discussed in Sections 1.2, 1.3, 3.4, 3.5, and 4.2.

7.0 DEFINITIONS

7.1 Inspection Follow-Up Items Inspector Follow-up Items are matters which have been discussed with the licensee, which will be reviewed by the inspector and which involve some action on the part of the NRC or licensee or both. Inspector Follow-up Items disclosed during the inspection are discussed in Sections 1.4 and 3.4.

7.2 Unresolved Items Unresolved Items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. Unresolved Items disclosed during the inspection are discussed in Section 1.5.