

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Report No: 50-456/98012(DRP); 50-457/98012(DRP)

Licensee: Commonwealth Edison Company

Facility: Braidwood Nuclear Plant, Units 1 and 2

Location: RR #1, Box 84
Braceville, IL 60407

Dates: July 28 through September 8, 1998

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EXECUTIVE SUMMARY

Braidwood Nuclear Plant, Units 1 & 2 NRC Inspection Report 50-456/98012(DRP); 50-457/98012(DRP)

This inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a six-week period of resident inspection from July 28 through September 8, 1998.

Operations

- The inspectors concluded that a Unit 1 unit supervisor failed to perform a turnover of the control room command and control function in accordance with established management expectations. This inappropriate action resulted in a failure to comply with Technical Specification 6.2.2.b which requires that at least one licensed senior reactor operator be in the control room when either Unit is in Mode 1, 2, 3, or 4. A non-cited violation was issued. The inspectors concluded that the immediate corrective actions taken adequately addressed the cause of the event and appeared to be effective in preventing recurrence. The long-term corrective actions have all been entered into the licensee's nuclear tracking system. (Section O1.1)
- The inspectors observed the Unit 2 power descension, ascension and return to service of the 2C main feed pump. The inspectors concluded that the nuclear station operators and unit supervisor demonstrated good overall command and control based on observations of control board operations, oversight of operator license training candidates, and response to unexpected alarms. The inspectors concluded that three material condition problems presented distractions to plant operators, however, they were handled well by nuclear station operators and the unit supervisor. (Section O1.2)
- The inspectors concluded that the licensee properly performed a shutdown of the Unit 1 reactor in accordance with station procedures. During the shutdown, the licensee demonstrated excellent control of reactivity changes; provided additional personnel to prevent distractions to operators conducting the reactor shutdown; used three-way communications, procedural place keeping methods, and self-checking techniques; performed independent verifications where required; and responded promptly to annunciator alarms. The inspectors concluded that Unit 1 equipment responded as designed to the manual trip of the turbine and to the manual trip of the reactor. One material condition problem occurred when the startup feedwater pump had to be secured due to failed inboard pump seal. (Section O1.3)
- Operators responded well to a loss of offsite power on Unit 1. Operations management personnel demonstrated good command and control. The event was quickly and correctly classified as an Unusual Event. Licensee management quickly assessed the extent of the damage to Unit 1 and restored offsite power. Four breakers failed to close that prevented re-energizing four nonsafety-related 480 volt buses and presented a minor complication to the recovery of the event. (Section O1.4)

Maintenance

- The inspectors observed all or portions of seven maintenance activities. The inspectors concluded that activities were performed in accordance with the applicable procedures, that the procedures provided the requisite information necessary to perform the work, that maintenance personnel demonstrated good work practices, and that maintenance personnel were knowledgeable of the associated limiting conditions for operations and high-risk work activity requirements. (Section M1.1)
- The inspectors observed the performance of eight surveillance tests. The inspectors concluded that the surveillance tests adequately tested the system, the operators followed the procedures, and that the procedures included the required testing discussed in the Technical Specifications. (Section M1.2)
- Several material condition problems directly affected plant operations during this inspection period. Most failures involved nonsafety-related equipment but occurred during evolutions such as a feedwater pump swap, reactor shutdown, and a loss of offsite power. These equipment failures did not have a profound impact but did complicate the evolutions. The inspectors did not identify a common cause for these equipment failures. (Section M2.1)

Engineering

- The inspectors concluded that three operability determinations regarding the essential service water supply to the auxiliary feedwater system, the Unit 2 reactor cooling pump motor temperature measurement, and the measurement of main control room differential pressure reflected sound engineering judgement and safety focus. The inspectors also concluded that the operability determinations were properly documented, were understood by control room operators, and that appropriate corrective actions had been identified and were being tracked by system engineering personnel. (Section E1.1)

Plant Support

- The inspectors performed a review of the licensee's fire barrier impairment program. Although the inspectors identified a number of administrative errors, it was concluded that all required compensatory actions for degraded fire barriers were in place. Additionally, after the inspector's review, the licensee performed a self-assessment of the fire barrier impairment program. The licensee identified and corrected additional administrative issues, and planned to develop process improvements, and perform additional assessments to ensure continued program effectiveness. (Section F1.1)

Report Details

Summary of Plant Status

Unit 1 entered the period at full power. A planned shutdown of the Unit was performed on September 5, 1998, to support refueling and steam generator replacement outage A1RO7. The unit experienced a loss of offsite power on September 6 with the unit in mode 5 (cold shutdown) due to a lightning strike

Unit 2 entered the period at full power and remained at or near full power for the entire period.

I. Operations

O1 Conduct of Operations

O1.1 Technical Specification Minimum Control Room Manning Not Met

a. Inspection Scope (71707)

The inspectors reviewed Licensee Event Report (LER) 50-456/98002-00, "No Senior Reactor Operator In the Control Room As a Result of Supervisory Misjudgment." The inspectors assessed the effectiveness of the immediate corrective actions taken, discussed corrective actions with operations personnel, and reviewed long-term corrective actions to be implemented.

b. Observations and Findings

On July 19, 1990, the licensee identified that for a period of 42 seconds there were no licensed senior reactor operators in the control room, a condition prohibited by Technical Specification 6.2.2.b. The inspectors had previously documented the event in Inspection Report 50-456/457/98009, Section O1.1 as unresolved item 50-456/457/98009-01(DRP).

The inspectors performed a review LER 50-456/98002-00 and determined that the licensee had identified the root cause, assessed the safety consequences, and identified and implemented corrective actions to prevent recurrence of the event. The licensee determined that the event was caused by a personnel error when the Unit 1, unit supervisor failed to perform a turnover of command and control prior to leaving the main control room; contrary to management expectations. To address this failure, the licensee provided counseling to the unit supervisor reinforcing management's expectation on the performance of turnovers for command and control, and disciplined the unit supervisor in accordance with station guidelines. The licensee, also, held senior management discussions with the operating crews to reinforce management expectations regarding face-to-face communications during turnovers and ensuring that the nuclear station operators were made aware of who has command and control, and implemented physical and electronic barriers in the security system to serve as

reminders to the senior reactor operators of the turnover requirements prior to leaving the main control room.

The inspectors assessed the effectiveness of the licensee's immediate corrective actions and noted a heightened level of awareness by all operations personnel in the main control room concerning command and control responsibilities. The inspectors observed face-to-face turnovers of command and control in accordance with the current management expectation and noted that the transfer of command and control was announced to the nuclear station operators. The inspectors did not observe any challenges of the recently implemented security system barriers by personnel holding senior reactor operator licenses.

The licensee identified several long-term corrective actions that either have been or will be implemented. First, the licensee changed Braidwood Administrative Procedure BwAP 300-1, "Conduct of Operations," to include management's expectation for a face-to-face communications during turnovers. Second, the licensee training department will include a discussion of the event and reinforce management's expectations to all licensed personnel as part of Operator Requalification Program. This action shall be performed by the shift operations supervisor and will be tracked to completion via the licensee's nuclear tracking system (NTS). Third, the operations manager will perform an effectiveness review of the corrective actions following their implementation. This action will also be tracked to completion via the licensee's NTS.

Technical Specification 6.2.2.b states, in part, "that at least one licensed Senior Reactor Operator be in the Control Room when either Unit is in Mode 1, 2, 3, or 4." Contrary to the above, on July 19, 1998, with both Units in Mode 1, there were no licensed senior reactor operators in the control room for a period of 42 seconds. This non-repetitive, licensee-identified and corrected violation is being treated as a non-cited violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (50-456/98012-01(DRP); 50-457/98012-01(DRP)).

c. Conclusions

The inspectors concluded that a Unit 1 unit supervisor failed to perform a turnover of the control room command and control function in accordance with established management expectations. This inappropriate action resulted in a failure to comply with Technical Specification 6.2.2.b which requires that at least one licensed senior reactor operator be in the control room when either Unit is in Mode 1, 2, 3, or 4. A non-cited violation was issued. The inspectors concluded that the immediate corrective actions taken adequately addressed the cause of the event and appeared to be effective in preventing recurrence. The long-term corrective actions have all been entered into the licensee's nuclear tracking system.

O1.2 Unit 2 Power Descension and Ascension in Support of Returning the 2C Main Feed Pump to Service.

a. Inspection Scope (71707)

The inspectors reviewed Braidwood Administrative Procedure BwAP 300-1, "Conduct of Operations," Revision 19E1; BwAP 320-1, "Human Performance Awareness of Pre-Job Briefings/Meetings and Self Checking," Revision 5; Braidwood General Operating Procedure BwGP 100-3, "Power Ascension," Revision 14; BwGP 100-4, "Power Decension," Revision 11; Braidwood Operating Procedure BwOP FW-1, "Startup of a Turbine Driven Main Feed Pump," Revision 12E1; and BwOP FW-23, "Swapping Feedwater Pumps," Revision 0E1. The inspectors interviewed unit supervisors and nuclear station operators; and observed the general conduct of control room activities during the Unit 2 power descension, main feed pump 2C startup and swapping, and subsequent Unit 2 power ascension.

b. Observations and Findings

The inspectors attended the heightened level of awareness briefings for the Unit 2 power descension, ascension, and the startup and swapping of the 2C main feed pump. The unit supervisor conducted the briefings and was knowledgeable of topics covered. All licensed and non-licensed operators involved with the evolution as well as two license trainees were in attendance.

The inspectors observed control board operations and the control of evolutions by the Unit 2 nuclear station operators and the unit supervisor. The nuclear station operators were attentive, made proper use of operating procedures, utilized self-checks when manipulating controls for equipment, and made appropriate use of three-way communications. Throughout the evolution, a senior reactor operator acted as a reactivity manager. All changes to reactivity including borate, dilution or control rod manipulation were discussed with the reactivity manager prior to performance.

During the evolution, two operator license training candidates performed reactivity manipulations and main turbine load changes. The inspectors noted that the trainees were closely supervised by a nuclear station operator in accordance with BwAP 300-1. The nuclear station operators ensured the trainees read and understood each step of BwGP-3, BwGP-4, BwOP FW-1, and BwOP FW-23; ensured the trainees clearly identified all components to be operated; and ensured the trainees understood the effect that actions taken would have on the reactor plant. In all cases, when the trainees performed control manipulations, the nuclear station operators conscientiously observed the necessary indications.

During the evolution, the inspectors observed three material condition problems that presented distractions to the plant operations at hand. These problems included:

- The Unit 0 component cooling (CC) water heat exchanger outlet process liquid Monitor OPR09J spuriously alarmed resulting in alarms in the control room and an automatic closure of both Unit 1 and Unit 2 CC surge tank vent

Valves 1CC017 and 2CC017. This problem had been previously identified by the licensee.

- The Unit 2 digital rod position indication system "urgent failure" and "rod bottom" alarms were received. These problems with the Unit 2 digital rod position indication system were previously identified by the licensee.
- A misaligned position indication limit switch on the 2C main feed pump low pressure stop valve momentarily prevented restarting of the main feed pump subsequently delaying the overspeed trip test required by BwOP FW-1.

Control room operators handled each problem well by acknowledging each alarm or condition and utilizing other appropriate indications or dispatching operators into the field to ensure the reason for the alarms were understood prior to continuing.

c. Conclusions

The inspectors observed the Unit 2 power descension, ascension and return to service of the 2C main feed pump. The inspectors concluded that the nuclear station operators and unit supervisor demonstrated good overall command and control based on observations of control board operations, oversight of operator license training candidates, and response to unexpected alarms. The inspectors concluded that three material condition problems presented distractions to plant operators, however, they were handled well by nuclear station operators and the unit supervisor.

O1.3 Unit 1 Reactor Shutdown

a. Inspection Scope (71707, 50001)

The inspectors observed operators perform a normal shutdown of Unit 1 for refueling outage AIR07 and steam generator replacement. The inspectors reviewed Braidwood General Procedure 1BwGP 100-4, "Power Descension," Revision 11; 1BwGP 100-5, "Plant Shut Down and Cooldown," Revision 17; Braidwood Operating Procedure BwOP CV-6, "Operation of the Reactor Makeup System in the Borate/Batch Borate Mode," Revision 8E1; and Braidwood Administrative Procedure BwAP 300-1, "Conduct of Operations," Revision 20.

b. Observations and Findings

On September 4 and 5, the inspectors observed a shutdown of the Unit 1 reactor and noted that it was performed in accordance with 1BwGP 100-4 and 1BwGP 100-5. nuclear station operators (NSO) controlled changes in reactivity and maintained reactor coolant average temperature within required limits. The inspectors noted that all reactivity manipulations were directly supervised by a dedicated reactivity control supervisor. Inspectors observed that control room operators used proper three-way communications, used procedure place keeping methods, and performed proper self-checks and independent verifications when required. The inspectors observed that the NSOs promptly responded to annunciator alarms, announced the alarm to supervisors

and reviewed annunciator response procedures. The inspectors observed that control room staffing exceeded the minimum manning requirements of the Technical Specifications which provided additional support to the control room staff.

The inspectors observed operators trip the turbine in accordance with 1BwGP 100-4. The inspectors noted that the main steam bypass valves and generator output breakers functioned as designed on the turbine trip. The inspectors observed the operators manually trip the reactor in accordance with 1BwGP 100-5. All control rods fully inserted. The inspectors observed all nuclear instrumentation channels and verified that the reactor had been made subcritical. On September 5, the operators secured the Unit 1 startup feedwater pump and started the 1A main feedwater pump because of an inboard pump seal failure.

c. Conclusions

The inspectors concluded that the licensee properly performed a shutdown of the Unit 1 reactor in accordance with station procedures. During the shutdown, the licensee demonstrated excellent control of reactivity changes; provided additional personnel to prevent distractions to operators conducting the reactor shutdown; used three-way communications, procedural place keeping methods, and self-checking techniques; performed independent verifications where required; and responded promptly to annunciator alarms. The inspectors concluded that Unit 1 equipment responded as designed to the manual trip of the turbine and to the manual trip of the reactor. One material condition problem occurred when the Unit 1 startup feedwater pump had to be secured due to a failed inboard pump seal.

O1.4 Unit 1 Loss of Offsite Power

a. Inspection Scope (71707)

The inspectors were making routine observations in the control room when Unit 1 experienced a loss of offsite power.

b. Observations and Findings

On September 6, 1998, at 9:07 p.m. lightning struck near the Unit 1 containment. The lightning strike cause a fault to ground on the C phase of bus 4 which fed both Unit 1 system auxiliary transformers (SATs). The fault caused both breakers ACB 3-4 and OCB 4-7 that fed the SATs to trip open. Unit 1 was shutdown and in Mode 5 at the time.

The inspectors were in the control room at the time power was lost. The inspectors observed that the licensee entered the appropriate operating procedure. The diesel generators started as expected and shutdown cooling was restored within two minutes.

The operators responded well to the casualty. Operations management personnel demonstrated good command and control. Face to face communications were good. The inspectors verified the licensee quickly and used the General Station Emergency Procedures (GSEP) to correctly classified the loss of power as an Unusual Event.

The most significant problem was that the feed breakers to 480 volt nonsafety-related busses 133Y, 134Y, 134Z, and 134V could not be shut electrically from the control room. This resulted in the loss of some control room indications such as data from the meteorological tower and non-essential service water pressure, and loss of power to two fire protection zones which required compensatory actions.

Station management demonstrated good safety focus by quickly assessing what actions were required to restore offsite power to Unit 1. The SATs and associated bus work were inspected and oil samples were taken from the SATs. The licensee concluded that no damage was done to the SATs and restored offsite power to Unit 1, then exited the Unusual Event at 5:55 a.m. on September 7, 1998.

Unit 2 was only slightly affected by the loss of power. The Unit 2 digital electro-hydraulic control system computer for main turbine control was lost and the Unit 2 turbine was placed in manual control. The event will be further discussed in Licensee Event Report 50-456/98003-00.

c. Conclusions

Operators responded well to a loss of offsite power on Unit 1. Operations management personnel demonstrated good command and control. The event was quickly and correctly classified as an Unusual Event. Licensee management quickly assessed the extent of the damage to Unit 1 and restored offsite power. Four breakers failed to close that prevented re-energizing four nonsafety-related 480 volt buses and presented a minor complication to the recovery of the event.

O8 Miscellaneous Operations Issues (92901 and 92700)

- O8.1 (Closed) Violation 50-456/96018-01: Failure to have a procedure or guidance for bypassing CV-121. In October 1996, Unit 1 pressurizer power operated relief valve 1RY-455A actuated in the cold over pressure protection mode due to elevated pressurizer level and pressure, and high differential pressure across 1CV-121. The licensee determined that a procedural allowance for an 80 percent level in the pressurizer during plant cooldown in BwGP 100-5, "Plant Shutdown and Cooldown," Revision 11 and the absence of a procedure for bypassing 1CV-121 resulted in the high pressurizer level and pressure that lifted the relief valve. This issue was previously discussed in inspection report 50-456/97013 where it was determined that the licensee had made adequate procedure revisions. However, the item was left open because the licensee had placed the flow control problem with 1CV-121 on the operator work around list and had not decided how to resolve the problem. The licensee has since throttled a downstream isolation valve to reduce the back pressure on 1CV-121 and

reduce the differential pressure during plant cooldown. Several shutdown and cooldown evolutions have subsequently been performed with no recurrence of this problem. The inspectors have no further concerns. This item is closed.

- O8.2 **(Closed) Violation 50-456/457/97009-04:** Failure to verify primary containment integrity every 31 days. The licensee identified that the vent and drain valves for pressure indicators 1(2)PI-929, which were required to be closed to maintain containment integrity, were not listed in surveillance test Procedure 1(2) BwOS 6.1.1.a-1, "Unit one (two) Primary Containment Integrity Verification of Isolation Devices Outside of Containment," Revision 7E2, and had not been verified closed on a 31 day frequency. The licensee committed to revising 1(2) BwOS 6.1.1.a-1 and performing a review of other valves for addition to the surveillance. The inspectors verified that the procedures were revised and the review was performed. The inspectors have no further concerns. This item is closed.
- O8.3 **(Closed) LER 50-456/98002-00:** No licensed senior reactor operator in the control room as a result of a personnel error. On July 19, 1998, the licensee informed inspectors that, for a period of 42 seconds, there were no licensed senior reactor operators in the control room, a condition prohibited by Technical Specification 6.2.2.b. The inspectors reviewed LER 50-456/98002-00 and determined that the licensee had identified the root cause, assessed the safety consequences, and identified and implemented corrective actions to prevent recurrence of the event. This item is closed to non-cited violation 50-456/98012-01(DRP); 50-457/98012-01(DRP) discussed in Section O1.1 of this report.
- O8.4 **(Closed) Unresolved Item 50-456/457/98009-01(DRP):** No licensed senior reactor operator in the control room as a result of a personnel error. On July 19, 1998, the licensee informed inspectors that for a period of 42 seconds there were no licensed senior reactor operators in the control room, a condition prohibited by Technical Specification 6.2.2.b. The inspectors reviewed LER 50-456/98002-00 and determined that the licensee had identified the root cause, assessed the safety consequences, and identified and implemented corrective actions to prevent recurrence of the event. This item is closed to non-cited violation 50-456/98012-01

II. Maintenance

M1 Conduct of Maintenance

M1.1 Maintenance Activity Observations

a. Inspection Scope (62707)

The inspectors observed all or portions of the following maintenance activities:

- Troubleshooting of the Unit 2 rod control system in accordance with work request (WR) 980084252-01.

- Replacement of the Unit 2 "M" 4-way directional control valve on the 2A main steam isolation valve in accordance with WR 980077872-01.
- Repair of the 2A main steam isolation hydraulic relief valve in accordance with WR 980077619-01.
- Disassembly, reassembly, and cleaning of the 1A essential service water (SX) cubicle cooler in accordance with WR 970056272-01.
- Oil and oil filter change on the 1A SX pump (1SX01PA) in accordance with WRs 970018400-01 and 970018397-01.
- Fit-up and welding of Unit 1 SX system flow sensing line (to 1A containment spray pump room cubicle cooler) in accordance with WR 980107901-01.
- Diagnostic testing of motor operated valve 1SI8923A in accordance with WR 970048819-01.
- Unit 2 solid state protection system trouble shooting and repair with WR 980083030-01.

b. Observations and Findings

Between July 27 and September 4, the inspectors observed all or portions of the maintenance activities listed above. The inspectors selected and observed maintenance activities associated with systems or components that were identified as performing important functions in the licensee's risk analysis. The inspectors attended the heightened-level-of-awareness meetings; reviewed the above work packages; reviewed high-risk work check sheets, if applicable; walked down the work areas with maintenance personnel; questioned personnel concerning the scope of the work, including system status and precautions for electrical safety; observed the establishment of required system conditions; observed the use of foreign material exclusion controls; reviewed applicable welding procedures and "hot work" permits, if applicable; and observed the use of quality control "hold points." The inspectors also reviewed the associated limiting condition for operation (LCO), if applicable, and reviewed the control room logs for LCO entry and exit log entries. The inspectors noted no problems during the above reviews, interviews and observations.

c. Conclusions

The inspectors observed all or portions of seven maintenance activities. The inspectors concluded that activities were performed in accordance with the applicable procedures, that the procedures provided the requisite information necessary to perform the work, that maintenance personnel demonstrated good work practices, and that maintenance personnel were knowledgeable of the associated limiting conditions for operations and high-risk work activity requirements.

M1.2 Observation of Miscellaneous Surveillance Activities

a. Inspection Scope (61726)

The inspectors observed all or portions of the following surveillance activities:

- Braidwood Operating Surveillance Procedure 1BwOS 6.2.3.a-1, "Reactor Containment Fan Cooler Monthly Surveillance," Revision 5.
- 2BwOS 8.1.1.2.a-1, "Unit Two 2A Diesel Generator Operability Monthly (Staggered) and Semi-Annual (Staggered) Surveillance," Revision 12E1.
- Braidwood Engineering Surveillance Procedure BwVS 4.5.2.f.1.a, "Surveillance Requirement for _A Centrifugal Charging Pump Discharge Pressure," Revision 1.
- 1BwVSR 5.5.8.RH.1, "ASME [American Society of mechanical Engineering] Surveillance Requirements for residual heat removal Pump 2RH01PA," Revision 0.
- 1BwVS 1.2.3.1-1, "ASME Surveillance Requirements for 1A Centrifugal Charging Pump and Check Valve 1CV8480A Stroke test," Revision 1.
- 1BwVSR 5.5.8.SI.1, "ASME Surveillance requirements for the 1A Safety Injection Pump," Revision 0.
- 2BwVSR 5.5.8.DO.1, "ASME Surveillance Requirement for Testing the Diesel Oil Transfer System," Revision 0.
- 2BwVS 0.5-3.CC.1-2, "ASME Surveillance Requirements for Component Cooling Pump 2CC01PB and Discharge Check Valve," Revision 3.

b. Observations and Findings

Between July 27 and September 4, the inspectors observed the surveillance tests listed above. The inspectors selected and observed surveillance tests that demonstrated operability of systems or components that were identified as performing important functions in the licensee's risk analysis. For each surveillance test, the inspectors observed the establishment of initial conditions required for the surveillance test, the operation of equipment, the communications between the licensed operators in the control room and non-licensed operators in the auxiliary building, and the restoration of affected equipment. The inspectors determined that each of these activities were performed in accordance with the applicable procedure. The inspectors reviewed the data obtained during the surveillance tests and noted that it met the required acceptance criteria specified in the surveillance test procedures. The inspectors also reviewed the associated portions of the Updated Final Safety Analysis Report and the Technical Specifications and determined that the surveillance test procedures demonstrated the systems performed as designed.

c. Conclusions

The inspectors observed the performance of eight surveillance tests. The inspectors concluded that the surveillance tests adequately tested the system, the operators followed the procedures, and that the procedures included the required testing discussed in the Technical Specifications.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Station Material Condition Deficiencies

a. Inspection Scope (62707)

The inspectors made several observations during evolutions that identified material condition problems.

b. Observations and Findings

During this inspection period the units experienced several material condition problems that affected plant operations. The first was the failure of the 2C feedwater pump control circuitry. During the swapping evolution from the 2C feedwater pump to the 2A then back after repairs, three material condition problems resulted in distractions to the operators (Section O1.1). The first was Unit 0 CC heat exchanger outlet liquid process radiation monitor spuriously alarmed that caused the automatic closure of the Unit 1 and Unit 2 CC surge tank vent valves. The second was the Unit 2 digital rod position indication system urgent failure and rod bottom alarms received due to recurring spurious system failures. The third was a misaligned position indication limit switch on the 2C main feed pump low pressure stop valve momentarily prevented restarting the 2C main feedwater pump. In addition, the licensee experienced a conductivity problem with a test switch on the Unit 2 SSPS resulting in entering a six hour Technical Specification limiting condition for operation. During the Unit 1 reactor shutdown the operators had to secure the Unit 1 startup feedwater pump (1FW02P) and start the motor driven feed water pump (1FW01PA) due to a failure of the 1FW02P inboard pump seal. On September 5, the operators secured the 0B non-essential service water pump and the discharge check valve failed to close. The operators then closed the 0B service water pump discharge valve and took the 0B service water pump OOS. Finally, during the loss of offsite power on Unit 1 on September 6, four Westinghouse DS-416 480 volt breakers were opened by procedure at the start of the casualty and failed to shut electrically from the control room. The licensee determined that the problem with the breakers was improper lubrication. Westinghouse 480 volt DS-416 breakers have been a recurring problem. The licensee has a refurbishment program ongoing with Westinghouse for the some of the DS-416 breakers. The breakers that failed during the loss of offsite power were not within the scope of the breakers to be refurbished.

c. Conclusions

Several material condition problems directly affected plant operations during this inspection period. Most failures involved nonsafety-related equipment but occurred during evolutions such as a feedwater pump swap, reactor shutdown, and a loss of offsite power. These equipment failures did not have a profound impact but did complicate the evolutions. The inspectors did not identify a common cause for these equipment failures.

M8 Miscellaneous Maintenance Issues (92902)

M8.1 (Closed) Violation 50-456/457-97005-02(DRP): Failure to take timely corrective actions for an inadequate fire barrier seal in the auxiliary building. On March 24, 1997, the inspectors identified a plant barrier between auxiliary building fire zones that had been degraded since June 6, 1996. No work request to restore the plant barrier could be identified by plant personnel. Therefore, no traceable action on restoration of the barrier existed. The licensee immediately initiated an action request for the sealing of the floor plug. This action was completed on April 18, 1998. The licensee revised Maintenance Memo 200-18, "Floor Plug Removal," to indicate the requirement to install fire resistant caulking as committed in the Braidwood Fire Protection Report; to require the reinstallation of floor plugs to be controlled by the submittal of an action request; and to include the results of a systematic review of all floor plugs to ensure the plug's functions (i.e. fire protection, flood barrier, ventilation boundary, or radiation barrier) were clearly stated and reference applicable seal detail drawings. The revision of the Maintenance Memo was completed on August 28, 1998. The inspectors reviewed the revised Maintenance Memo and inspected all the floor plugs on 401 foot elevation of the auxiliary building. The inspectors determined that the corrective actions taken by the licensee to address the causes were effective. This violation is closed.

III. Engineering

E1 Conduct of Engineering

E1.1 Operability Determination Reviews

a. Inspection Scope (37551)

The inspectors reviewed the following documents:

- Operability Evaluation 98-42, "The SX Water System is the Safety-Related Supply of Water to the Auxiliary Feedwater System. This Function May Be Degraded";
- Operability Evaluation 98-43, "Failure of 2A Reactor Coolant Pump Motor Lower Thrust Bearing and 2C Reactor Coolant Pump Motor Lower Radial Bearing Resistance Temperature Detectors"; and

- Operability Evaluation 98-44, "Questions Regarding the Adequacy of Main Control Room Differential Measurements."

The inspectors discussed the operability determinations with control room operators and system engineering personnel.

b. Observations and Findings

The inspectors verified that the documentation of the operability evaluations met Braidwood Administrative Procedure 330-10, "Operability Determinations," requirements, that the licensee complied with Technical Specification requirements, and that the assumptions used to develop the operability determinations were valid. The inspectors briefly discussed the operability evaluations with control room operators and determined that operators were aware of, and understood the contents of the operability evaluations. The inspectors discussed the associated corrective actions with system engineering personnel and determined that corrective actions addressed the problems and were being tracked either by action requests or in the licensee's nuclear tracking system.

c. Conclusions

The inspectors concluded that three operability determinations regarding the essential service water supply to the auxiliary feedwater system, the Unit 2 reactor cooling pump motor temperature measurement, and the measurement of main control room differential pressure reflected sound engineering judgement and safety focus. The inspectors also concluded that the operability determinations were properly documented, were understood by control room operators, and that appropriate corrective actions had been identified and were being tracked by system engineering personnel.

E8 Miscellaneous Engineering Issues (92700 and 92903)

- E8.1 **(Closed) LER 50-456/96010-02:** Boraflex shrinkage and gaps exceeded largest gap assumed in spent fuel pool criticality analysis. On September 20, 1996, the licensee identified in LER 50-456/96010-00 that spent fuel racks had boraflex shrinkage and gaps which exceeded the largest gap assumed in the licensee criticality analysis for the spent fuel pit. On March 3, 1997, the licensee also identified in supplemental LER 50-456/96010-01 a modeling deficiency in the original spent fuel pit criticality analysis. The original analysis assumed boraflex poison plates were located on all four faces of a particular storage cell within the spent fuel pit which was not correct. Some peripheral fuel storage cells do not have boraflex poison in the exterior plates. The licensee determined that with the fuel separation design of the fuel pool and administratively maintaining the fuel pool water at $\geq 2,000$ ppm boron the K_{eff} of the pool will be less than 0.95. The licensee requested and received a license amendment changing the Technical Specification to allow for soluble boron to be credited in maintaining the spent fuel pit $K_{eff} \leq 0.95$. This license amendment has been incorporated into the current Technical Specification and implemented procedurally by the licensee. LER 50-456/96010-02 was issued by the licensee to document

completion of the corrective actions listed in LERs 456/96010-00 and 456/96010-01. This item is closed.

- E8.2 **(Closed) VIO 50-456/457/98005-05:** Failure of the licensee to initiate corrective actions with a problem identification form. On October 4, 1995, the licensee evaluated the use of the Tri-Nuclear filters within the spent fuel pit and determined that their use did not constitute the need to be evaluated as a temporary alteration in accordance with BwAP 2321-18, "Temporary Alterations," Revision 3E1. On September 12, 1997 the licensee identified that the original determination was incorrect and that the use of the filters should either be evaluated as a temporary alteration or proceduralized but did not initiate corrective actions with a problem identification form in accordance with Nuclear Station Work Procedure A-15, "ComEd Nuclear Division Integrated Reporting program," Revision 1. Corrective actions taken by the licensee included issuing a problem identification form to document the problem; developing procedure BwFP FH-33 "Operation of the Tri-Nuclear Filtration Systems," Revision 0; and conducting training with engineering personnel concerning the importance of promptly communicating anomalous conditions and following the station's problem identification process. This item is closed.

IV. Plant Support

F1 Control of Fire Protection Activities

F1.1 Audit of the Plant Fire Barrier Impairment Program

a. Inspection Scope (71750)

The inspectors reviewed Braidwood Administrative Procedure BwAP 1110-1, "Fire Protection Program System Requirements," Revision 8; BwAP 1110-3, "Plant Barrier Impairment Program," Revision 7; and BwAP 1100-8, "Fire Protection Impairment and Abnormal Operating Conditions," Revision 5. The inspectors reviewed 79 active plant barrier impairment permits, performed walkdowns of 20 fire barrier impairments, and discussed the fire barrier impairment program with the Fire Marshal.

b. Observations and Findings

Administrative Procedure BwAP 1110-3 defined a barrier impairment as any level of degradation of the design details of such items as concrete walls; fireproofing, electrical and mechanical penetrations; fire dampers; security barriers; and heating, ventilation, and air conditioning penetrations. The inspectors reviewed all of the active plant barrier impairment permits; 79 in total. Although the inspectors identified five incomplete permits, the proper fire protection compensatory actions (i.e., fire watches) were in place in accordance with BwAP 1110-1. The inspectors performed walkdowns of 20 active plant barrier impairments. BwAP 1110-3 Step E.7.a states, in part, that a red plant barrier impairment (PBI) tag should be hung in a location that is easily visible and in close proximity to the impairment. The inspectors identified three locations for which

no PBI tag had been hung. Although BwAP 1110-3 states that the tags "should" be hung, clearly identifying the impairment aids fire watch individuals in performing the required compensatory actions. The inspectors did not identify any examples of degraded fire barriers for which the required compensatory actions had not been taken.

Subsequent to the inspectors review of the fire barrier impairment program, the licensee performed a self-assessment of the program. The licensee identified 10 additional examples of missing PBI tags from barrier impairment locations. The licensee placed PBI tags at the identified locations, is currently reviewing BwAP 1110-3 with system engineering and developing procedural improvements, and will be performing additional assessments to ensure continued program effectiveness.

c. Conclusions

The inspectors performed a review of the licensee's fire barrier impairment program. Although the inspectors identified a number of administrative errors, it was concluded that all required compensatory actions for degraded fire barriers were in place. Additionally, after the inspector's review, the licensee performed a self-assessment of the fire barrier impairment program. The licensee identified and corrected additional administrative issues, and planned to develop process improvements, and perform additional assessments to ensure continued program effectiveness.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on September 8, 1998. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

- *T. Tulon, Site Vice President
- *K. Schwartz, Station Manager
- *R. Wegner, Operations Manager
- R. Byers, Maintenance Superintendent
- A. Haeger, Health Physics and Chemistry Supervisor
- R. Graham, Work Control Superintendent
- *T. Simpkin, Regulatory Assurance Supervisor
- J. Kuchenbecker, System Engineering Supervisor
- *T. Luke, Engineering Manager
- *M. Cassidy, Regulatory Assurance - NRC Coordinator

NRC

- M. Jordan, Chief, Reactor Projects Branch 3
- C. Phillips, Senior Resident Inspector
- *J. Adams, Resident Inspector
- *D. Pelton, Resident Inspector
- T. Tongue, Project Engineer

IDNS

- *T. Esper

* Denotes those who attended the exit interview conducted on September 8, 1998.

INSPECTION PROCEDURES USED

| | |
|-----------|---|
| IP 37551: | Onsite Engineering |
| IP 61726: | Surveillance Observations |
| IP 62707: | Maintenance Observation |
| IP 71707: | Plant Operations |
| IP 71750: | Plant Support Activities |
| IP 50001: | Steam generator Replacement Inspection |
| IP 92700: | Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities |
| IP 92901: | Followup - Plant Operations |
| IP 92902: | Followup - Plant Maintenance |
| IP 92903: | Followup - Engineering |

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

| | | |
|---------------------|-----|----------------------|
| 50-456/457/98012-01 | NCV | control room manning |
|---------------------|-----|----------------------|

Closed

| | | |
|---------------------|-----|--|
| 50-456/96010-02 | LER | failure to provide required drawings |
| 50-456/96018-01 | VIO | failure to have procedural guidelines for bypassing CV-121 |
| 50-456/457/97005-02 | VIO | failure to take prompt corrective actions |
| 50-456/457/97009-04 | VIO | missed surveillance on containment isolation valve |
| 50-456/98002-00 | LER | control room manning |
| 50-456/457/98005-05 | VIO | failure to take corrective actions |
| 50-456/457/98009-01 | URI | control room manning |
| 50-456/457/98012-01 | NCV | control room manning |

LIST OF ACRONYMS USED

| | |
|-------|--|
| ASME | American Society of Mechanical Engineers |
| BwAP | Braidwood Administrative Procedure |
| BwGP | Braidwood General Operating Procedure |
| BwOP | Braidwood Operating Procedure |
| BwVS | Braidwood Engineering Surveillance Procedure |
| BwVSR | Braidwood Engineering Surveillance Procedure |
| CC | Component Cooling Water |
| CV | Chemical and Volume Control |
| CFR | Code of Federal Regulations |
| LCO | Limiting Condition for Operation |
| LER | Licensee Event Report |
| NRC | Nuclear Regulatory Commission |
| NRR | Nuclear Reactor Regulations |
| NSO | Nuclear Station Operator |
| NTS | Nuclear Tracking System |
| PBI | Plant Barrier Impairment |
| SAT | System Auxiliary Transformer |
| SI | Safety Injection |
| SSPS | Solid State Protection System |
| SX | Essential Service Water |
| VIO | Violation |
| WR | Work Request |