August 21, 2003

Mr. John L. Skolds, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2
NRC INSPECTION REPORT 50-456/03-05(DRS); 50-457/03-05(DRS)

Dear Mr. Skolds:

On July 11, 2003, the NRC completed an inspection at your Braidwood Station. The enclosed report documents the inspection findings which were discussed with Mr. T. Joyce and other members of your staff on July 11, 2003.

The inspection examined activities conducted under your license as they related to implementation of your NRC approved Fire Protection Program. The inspectors performed field walkdowns, interviewed personnel, and reviewed selected design drawings, calculations, analyses, procedures, and audits.

Based on the results of this inspection, the inspectors identified two issues of very low safety significance (Green). The issues were determined to involve violations of NRC requirements. However, the violations were Non-Cited Violations (NCVs) due to the very low safety significance of the issues and because they have been entered into your corrective action program. The violations are being treated as Non-Cited Violations (NCVs), in accordance with Section VI.A.1 of the NRC's Enforcement Policy.

If you contest the subject or severity of the Non-Cited Violations, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 801 Warrenville Road, Lisle, IL 60532-4351; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Braidwood Station.

In accordance with 10 CFR Part 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

/RA by Hershell Walker Acting For/

Julio F. Lara, Chief
Electrical Engineering Branch
Division of Reactor Safety

Docket Nos. 50-456; 50-457
License Nos. NPF-72; NPF-77

Enclosure: Inspection Report 50-456/03-05(DRS);
50-457/03-05(DRS)

cc w/encl: Site Vice President - Braidwood
Braidwood Station Plant Manager
Regulatory Assurance Manager - Braidwood
Chief Operating Officer
Senior Vice President - Nuclear Services
Senior Vice President - Mid-West Regional
Operating Group
Vice President - Mid-West Operations Support
Vice President - Licensing and Regulatory Affairs
Director Licensing - Mid-West Regional
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Manager Licensing - Braidwood and Byron
Senior Counsel, Nuclear, Mid-West Regional
Operating Group
Document Control Desk - Licensing
M. Aguilar, Assistant Attorney General
Illinois Department of Nuclear Safety
State Liaison Officer
Chairman, Illinois Commerce Commission

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Director Licensing - Mid-West Regional
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Manager Licensing - Braidwood and Byron
Senior Counsel, Nuclear, Mid-West Regional
Operating Group
Document Control Desk - Licensing
M. Aguilar, Assistant Attorney General
Illinois Department of Nuclear Safety
State Liaison Officer
Chairman, Illinois Commerce Commission

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REGION III

Docket Nos:	50-456; 50-457
License Nos:	NPF-72; NPF-77
Report No:	50-456/03-05(DRS); 50-457/03-05(DRS)
Licensee:	Exelon Generation Company, LLC
Facility:	Braidwood Station, Units 1 and 2
Location:	35100 S. Route 53 Suite 84 Braceville, IL 60407-9617
Dates:	June 23, 2003 through July 11, 2003
Inspectors:	Z. Falevits, Senior Reactor Inspector, Lead Inspector R. Langstaff, Senior Reactor Inspector R. Deem, Contractor Brookhaven National Laboratory K. Sullivan, Contractor Brookhaven National Laboratory
Observer:	A. Klett, Nuclear Safety Intern
Approved by:	J. F. Lara, Chief Electrical Engineering Branch Division of Reactor Safety

SUMMARY OF FINDINGS

Enclosure

IR 05000456/2003-005(DRS), IR 05000457/2003-005(DRS); Exelon Generation Company, LLC; 06/23/03 - 07/11/03; Braidwood Station, Units 1 & 2; Fire Protection Triennial.

This report covers an announced triennial fire protection baseline inspection. The inspection was conducted by Region III inspectors and two NRC contractors. The inspection identified two Green findings which were Non-Cited Violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be "Green" or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3; dated July 2000.

A. Inspector-Identified and Self-Revealed Findings

Cornerstone: Initiating Events and Mitigating Systems

- Green. A finding of very low significance was identified by the inspectors for a violation of 10 CFR Part 50, Appendix B, Criterion XVI. The licensee failed to assess and resolve recommendations to correct conditions adverse to quality as noted in the conclusion section of Calculation BYR 98-293/BRW 98-1287-E, dated October 1, 2001. The purpose of the calculation was to evaluate the 125 Vdc and 120 Vac circuits that supply safe shutdown equipment for adequate coordination such that a fire induced fault will not impact the shutdown capability of the plant.

  This issue is greater than minor because if these potential breaker coordination deficiencies were not corrected in a timely manner the undersized breaker may fail to clear a load fault and may trip the upstream MCC feed breaker resulting in the loss of the entire associated MCC. The issue was of very low safety significance because it did not result in loss of function per Generic Letter 91-18. The issue was a Non-Cited Violation of 10 CFR 50, Appendix B, Criterion XVI (Section 1R05.3b).

- Green. A finding of very low safety significance was identified by the inspectors for a violation of 10 CFR Part 50, Appendix B, Criterion XVI. The licensee failed to manually cycle/exercise numerous molded case circuit breakers (MCCBs) at the 120 Vac, 125Vdc, and 480 Vac voltage levels, on a pre-established periodic basis, as recommended by the MCCBs manufacturer, by NEMA AB-4, and as required by the Braidwood Station's Safe Shutdown Analysis.

  This issue was more than minor because if this concern is not corrected in a timely manner and the MCCB trip points drifts too high, or fails to trip, the breaker may fail to clear a load fault, as designed, and may trip the upstream motor control center (MCC) feed breaker resulting in the loss of the entire associated MCC. The issue was of very low safety significance because it did not result in loss of function per Generic Letter 91-18. This issue was a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion XVI.

B. Licensee-Identified Violations

No findings of significance were identified.

REPORT DETAILS

Summary of Plant Status

During the inspection period, Braidwood Station's Units 1 and 2 operated at or near full power.

1. REACTOR SAFETY

Cornerstones: Initiating Events and Mitigating Systems

1R05 Fire Protection (71111.05)

The purpose of this inspection was to review the Braidwood Station's Fire Protection Program (FPP) for selected risk-significant fire areas. Emphasis was placed on verifying that the post-fire safe shutdown capability and the fire protection features were maintained free of fire damage to ensure that at least one post-fire safe shutdown success path was available. The inspection was performed in accordance with the Nuclear Regulatory Commission's (NRC's) new regulatory oversight process using a risk-informed approach for selecting the fire areas and attributes to be inspected. The inspectors used the Braidwood Station's Individual Plant Examination of External Events (IPEEE) to choose several risk-significant areas for detailed inspection and review. The fire areas chosen for review during this inspection were:

- Fire Zone 3.2A-2, Unit 2 Cable Spreading Room, Nonsegregated Bus Duct Area
- Fire Zone 5.5-2, Unit 2 Switchgear Area, Auxiliary Electrical Equipment Room
- Fire Zone 11.4C-0, Unit 2 Auxiliary Building (Remote Shutdown Panels Area)

For each of these fire zones, the inspection focused on the fire protection features, the systems and equipment necessary to achieve and maintain safe shutdown conditions, determination of licensee commitments, and changes to the FPP.

.1 Systems Required to Achieve and Maintain Post-Fire Safe Shutdown

The guidelines established by Branch Technical Position (BTP) Chemical Engineering Branch (CMEB) 9.5-1, Section C.5.b, "Safe Shutdown Capability," paragraph (1), required the licensee to provide fire protection features that were capable of limiting fire damage to structures, systems, and components (SSCs) important to safe shutdown. The SSCs that were necessary to achieve and maintain post-fire safe shutdown were required to be protected by fire protection features that were capable of limiting fire damage to the SSCs so that:

- One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) was free of fire damage; and

- Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.

a. Inspection Scope

The inspectors reviewed the plant systems required to achieve and maintain post-fire safe shutdown to determine if the licensee had properly identified the components and systems necessary to achieve and maintain safe shutdown conditions for each fire zone selected for review. Specifically, the review was performed to determine the adequacy of the systems selected for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and support system functions. This review included the fire protection safe shutdown analysis.

The inspectors also reviewed the operators' ability to perform the necessary manual actions for achieving safe shutdown by reviewing procedures, the accessibility of safe shutdown equipment, and the available time for performing the actions.

The inspectors reviewed the Braidwood Station's Updated Final Safety Analysis Report (UFSAR) and the licensee's engineering and/or licensing justifications (e.g., NRC guidance documents, license amendments, technical specifications, safety evaluation reports, exemptions, and deviations) to determine the licensing basis.

A comparison of the safe shutdown equipment list (SSEL) components found in Table 2.4-2 of the SSA to plant Piping and Instrumentation Drawings (P&IDs) was made by the inspection team. On a sample basis, the inspection team verified that components having the potential to impact operation of the CVCS and AFW systems were properly analyzed in the SSA.

b. Findings

No findings of significance were identified.

.2 Fire Protection of Safe Shutdown Capability

The guidelines established by BTP CMEB 9.5-1, Section C.5.b, "Safe Shutdown Capability," Paragraphs (2)(a) and (3), required separation of cables and equipment and associated circuits of redundant trains by a fire barrier having a 3-hour rating. If the guidelines cannot be met, then alternative or dedicated shutdown capability and its associated circuits, independent of cables, systems or components in the area, room, or zone under consideration should be provided.

a. Inspection Scope

For each of the selected fire areas, the inspectors reviewed the licensee's Safe Shutdown Analysis (SSA) to ensure that at least one post-fire safe shutdown success path was available in the event of a fire. This included a review of manual actions required to achieve and maintain hot shutdown conditions and to make the necessary repairs to reach cold shutdown within 72 hours. The inspectors also reviewed procedures to verify that adequate direction was provided to operators to perform these manual actions. Factors such as timing, access to the equipment, and the availability of procedures, were considered in the review.

The inspectors also evaluated the adequacy of fire suppression and detection systems, fire area barriers, penetration seals, and fire doors to ensure that at least one train of safe shutdown equipment was free of fire damage. To do this, the inspectors observed the material condition and configuration of the installed fire detection and suppression systems, fire barriers, construction details, and supporting fire tests for the installed fire barriers. In addition, the inspectors reviewed licensee documentation, such as deviations, detector placement drawings, fire hose station drawings, carbon dioxide pre-operational test reports, smoke removal plans, Fire Hazard Analysis (FHA) reports, SSA, and National Fire Protection Association (NFPA) codes to verify that the fire barrier installations met license commitments.

b. Findings

No findings of significance were identified.

.3 Post-Fire Safe Shutdown Circuit Analysis

The guidelines established by BTP CMEB 9.5-1, Section C.5.b, "Safe Shutdown Capability," Paragraph (1), required that SSCs important to safe shutdown be provided with fire protection features capable of limiting fire damage to ensure that one train of systems necessary to achieve and maintain hot shutdown conditions remained free of fire damage. Options for providing this level of fire protection were delineated in BTP CMEB 9.5-1, Section C.5.b, "Safe Shutdown Capability," Paragraph (2). Where the protection of systems whose function was required for hot shutdown did not satisfy BTP CMEB 9.5-1, Section C.5.b, Paragraph (2), an alternative or dedicated shutdown capability and its associated circuits, were required to be provided that was independent of the cables, systems, and components in the area. For such areas, BTP CMEB 9.5-1, Section C.5.c, "Alternative or Dedicated Shutdown Capability," Paragraph (3), specifically required the alternative or dedicated shutdown capability to be physically and electrically independent of the specific fire areas and capable of accommodating post-fire conditions where offsite power was available and where offsite power was not available for 72 hours.

a. Inspection Scope

The inspectors performed a review of the licensee's SSA and Safe Shutdown Equipment List (SSEL) to determine whether the licensee had appropriately identified and analyzed the safety related and non-safety related cables associated with safe shutdown equipment located in the selected plant fire zones. The inspectors' review included the assessment of the licensee's electrical systems and electrical circuit analyses.

A sample of safety and non-safety related cables for equipment in the selected fire areas were evaluated to determine if the design requirements of Section III.G of Appendix R to 10 CFR Part 50 are being met. This included verifying that the licensee ensured that hot shorts, open circuits, or shorts to ground would not prevent implementation of safe shutdown.

b. Findings

Introduction: The inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion XVI, having very low safety significance (Green) for failing to address and evaluate conclusions made in the coordination calculation for 125 Vdc and 120 Vac post-fire safe shutdown circuits. This issue was considered to be NRC-identified because the licensee had failed to implement any corrective measures since the calculation was issued in October 2001.

Description: The inspectors reviewed Byron/Braidwood calculation BYR 98-293/BRW 98-1287-E, dated October 1, 2001. The purpose of the calculation was to evaluate the 125 Vdc and 120 Vac circuits that supply safe shutdown equipment for adequate coordination such that a fire induced fault will not impact the shutdown capability of the plant. The calculation stated that in lieu of extensive and detailed analysis, some circuit breaker changes may be recommended for circuits where coordination could not be ensured. However, the calculation documented that it is believed to be most cost effective to replace the protective device rather than perform this detailed analysis.

Section 7.2, "Conclusion/Recommendation," of the calculation, stated, in part, of the 125Vdc circuits fed by Distribution Panels 1/2DC05EA, 1/2DC05EB, 1/2DC06EA and EB, all installed breakers meet both acceptance criteria except the circuits supplying DC Fuse Panels 1/2DC10J and 1/2DC11J. For these circuits, the calculation recommended that the installed THED 70A breaker be replaced by a THED 100A breaker which meets both acceptance criteria. Also, coordination between 1/2DC05EB and 1/2DC06EB and the upstream 300A fuse could not be guaranteed. Further analysis of these circuits was recommended.

Section 7.2 of the calculation further stated that at all of the 120 Vac Panels, the HFB 30A breaker installed at the incoming feed for the bus did not meet Acceptance Criteria 2.2.1 and it was recommended that an HFB 70A breaker be installed as a replacement for these feed breakers, in lieu of a more detailed analysis. Also, QBH40A breaker was recommended replacement for QBH 15 and 20 Amp breaker.

The licensee could not provide documented evidence to show that the recommendations made in the calculation had been evaluated and addressed. The inspectors were informed that the information collected to address these recommendations was lost. Subsequently, the licensee assembled a draft document that included the External Design Analysis Review for calculation BYR 98-239/BRW 98-1287-E. The licensee's initial review stated that either further detailed analysis would be able to demonstrate coordination for the identified circuits or that coordination is not required for the fire safe shutdown component to perform its safe shutdown function. However, no formal documented analysis or coordination calculation was available for review to support this statement.

Analysis: The inspectors determined that failure to assess and address recommendations in the coordination calculation was a performance deficiency warranting a significance evaluation. The inspectors concluded that the findings was greater than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening," issued on June 20, 2003. The finding is more than minor because it would become a more significant safety concern if left uncorrected. These potential breaker coordination deficiencies could lead to undersized breaker not capable of clearing a load fault and tripping of the upstream feed breaker. This would result in the loss of the entire associated MCC necessary for post-fire safe shutdown operation. In addition, this finding could have affected the mitigating system objective of ensuring availability of auxiliary power systems that respond to initiating events such as fires.

The inspectors completed a significance determination of this issue using IMC 0609, "Significance Determination Process (SDP)," dated April 21, 2003, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations," dated March 18, 2002. Since this finding did not result in loss of function per Generic Letter 91-18, this finding was considered to be very low safety significance (Green). This finding is assigned to the mitigating systems cornerstone for both units.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," required, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviation, defective material and equipment, and nonconformances are promptly identified and corrected. In October 2001, the licensee identified, through coordination calculation, that circuit breaker replacement or detailed analysis may be recommended for circuits where coordination could not be ensured. During this inspection, the licensee failed to demonstrate that the recommendations made in the calculation had been evaluated and addressed. The licensee's failure to assess and resolve design calculation recommendations made to resolve deficient and potentially adverse conditions to plant quality/safety is considered a violation of 10 CFR Part 50, Appendix B, Criterion XVI. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program, this violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A of the NRC's Enforcement Policy. (NCV 50-456/457/03-05-01)

.4 Alternative Shutdown Capability

The guidelines established by BTP CMEB 9.5-1, Section C.5.b, "Safe Shutdown Capability," Paragraph (1), required the licensee to provide fire protection features that were capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot shutdown conditions remained free of fire damage. Specific design features for ensuring this capability were provided in BTP CMEB 9.5-1, Section C.5.b, Paragraph (2). Where compliance with the separation criteria of BTP CMEB 9.5-1, Section C.5.b, Paragraphs (1) and (2) could not be met, BTP CMEB 9.5-1, Section C.5.b, Paragraph (3) and Section C.5.c, required an alternative or dedicated shutdown capability be provided that was independent of the specific fire area under consideration. Additionally, alternative or dedicated shutdown capability must be able to achieve and maintain hot standby conditions and achieve cold shutdown conditions within 72 hours and maintain cold shutdown conditions thereafter. During the post-fire safe shutdown, the reactor coolant process variables must remain within those predicted for a loss of normal AC power, and the fission product boundary integrity must not be affected (i.e., no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary).

a. Inspection Scope

The inspectors reviewed the licensee's systems required to achieve alternative safe shutdown to determine if the licensee had properly identified the components and systems necessary to achieve and maintain safe shutdown conditions. The inspectors also focused on the adequacy of the systems to perform reactor pressure control, reactivity control, reactor coolant makeup, decay heat removal, process monitoring, and support system functions.

Redundant trains of equipment required to achieve post-fire safe shutdown conditions may be damaged as a result of fire in certain fire areas of the plant, such as the Main Control Room (MCR). Other fire areas, that are normally designated alternative shutdown areas contain equipment common to both system trains or both units at multi-unit sites. At Braidwood Station, each unit's Auxiliary Electrical Equipment Room (AEER), has electrical cables from both trains of MCR HVAC, and other equipment required for safe shutdown routed through them. To assess the alternative shutdown methodology developed by the licensee, an evaluation of the AEER was performed. For a fire in this area, redundant trains of equipment required to achieve and maintain safe shutdown are susceptible to fire damage. A fire in this area may also force the affected unit's operators to implement post-fire shutdown from the Remote Shutdown Panel (RSP) located adjacent to the radwaste control room in the auxiliary building, and use the instrumentation on the Fire Hazard Panel (FHP) for shutdown monitoring purposes. The AEER evaluation included assurance that safe shutdown equipment, shutdown procedures, and the post-fire safe shutdown analytical approach were consistent and satisfied the reactor performance criteria for safe shutdown.

b. Findings

No findings of significance were identified.

.5 Operational Implementation of Alternative Shutdown Capability

a. Inspection Scope

The inspectors performed a review of the licensee's operating procedures for alternative safe shutdown areas (0Bw0A PRI-5, Revision 101, "Control Room Inaccessibility, Unit 0" 2Bw0A PRI-5, Revision 100, "Control Room Inaccessibility, Unit 2"). The team also reviewed the licensee's operating procedures, which augment the post safe shutdown procedures, as well as 2Bw0A PRI-5, Rev.100, the procedure for alternative safe shutdown areas. The review focused on ensuring that all required functions for post-fire safe shutdown and the corresponding equipment necessary to perform those functions were included in the procedures. The review also looked at operator procedural training, as well as consistency between the operations shutdown procedures and any associated administrative controls.

b. Findings

Introduction: The inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion XVI, having very low safety significance (Green) for failure to exercise/cycle molded case circuit breakers and a potential age related degradation and common mode failure with Westinghouse adjustable magnetic HFB breakers. This issue was considered to be NRC-identified because the licensee had failed to correct this non-conforming condition since the last triennial fire protection inspection in 2000.

Description: During the last Triennial Fire Protection inspection in the Summer of 2000, the NRC identified that molded case circuit breakers (MCCB) at the 120 Vac and 125 Vdc voltage levels were not being periodically manually exercised, inspected, and tested as required by the Braidwood Station's Fire Protection Report (FPR), Chapter 2.4, "Safe Shutdown Analysis," Section 2.4.1.5, "Assumptions," paragraph 5.a. This was considered a violation of the Braidwood Station's Facility Operating License as documented in inspection report 50-456/00-06(DRS); 50-457/00-06(DRS).

During this inspection, the inspectors reviewed licensee's established program and corrective actions implemented to test and specifically manually exercise molded case circuit breakers at the 480 Vac, 120 Vac and 125 Vdc voltage levels. All power and control circuit breakers and fuses must be coordinated to ensure, in part, that in the event of a fire induced fault, safety related equipment needed for safe shutdown, is not susceptible to loss due to inadequate circuit breaker coordination.

The licensee's MCCBs testing program, which started several years ago, has identified numerous breakers with trip set points drifting high. The MCCBs have been tripping high out of tolerance (OOT) during surveillance testing. Condition Report (CR) 00105657 was initiated on April 26, 2002, to document, evaluate, and address an adverse trend and a potential common mode failure associated with the instantaneous trip settings on Westinghouse type HFB molded case circuit breakers (MCCBs).

These MCCBs are used as load feed breakers and provide component (i.e., MOVs, pumps, fans) short circuit fault protection and coordination within the Auxiliary Power distribution, during high fault currents. The MCCB must not trip prematurely on motor inrush current and must coordinate with the trip setting of the upstream motor control center (MCC) feeder breaker. Braidwood has approximately 3,000 safety and non safety-related MCCBs installed. The majority of the MCCBs installed in Braidwood Station were manufactured in the 1970's to 1980's. Periodic cycling, maintenance and testing of molded case circuit breakers is necessary to ensure that set-point drift remains within that allowed by the circuit breaker manufacturer and that the breakers remain functional.

The inspectors noted that numerous Condition Reports (CRs) had been written for failed MCCBs during electrical preventive maintenance (PM) surveillance testing. The CRs indicated that the breaker's trip set points have drifted high and the overcurrent instantaneous trip current values were higher than the values specified in the vendors acceptance criteria and the licensee test procedures. The failed breakers were being replaced with breakers from another manufacturer. The inspectors noted that in the past two years, approximately 65 MCCBs failed their PM surveillance test OOT high. Fifty two percent (47 of 90) of MCCBs tested from June 2002 to June 2003 failed OOT high. Also, twelve MCCBs tripped in service in the last two years, some due to marginal trip settings and several tripped inadvertently (e.g., ISI8804B, ISX016B and 1 (2) SI03P).

Licensee operability determination performed March 8, 2002, concluded that 79 MOV MCCBs needed trip set point changes to ensure that they do not trip prematurely on inrush currents (OOT low). Five Engineering Changes were initiated to change the settings of 176 MOVs (97 of the 176 needing change of setpoints were classified as enhancements). The licensee has completed setpoint changes on 40 of the 79 breakers. The remaining 38 (one required only a drawing change) are scheduled to be done by the end of this year.

The licensee stated that the trip points for all failed breakers, so far, had drifted high but were still within the coordination curves for the upstream MCC feed breakers. Therefore, the breakers are still capable of proving fault isolation and protection of the motor starter and feed cables from damage as a result of short circuits. All failed breakers were manufactured by Westinghouse and are type HFB magnetic only. The licensee documented in the work orders and condition reports for these failed MCCBs that coordination with the upstream breakers was not affected by the MCCBs tripping OOT high and that they remained operable. However, no specific operability determination was completed for the breakers tripping OOT high.

To determine the root cause(s) of the MCCB failures, Braidwood sent eight of the failed breakers to Exelon Power Labs for examination and evaluation in April 2002. The Power Lab concluded that all the breaker's examined exhibited some distortion and twisting of the trip bars and that this was the apparent cause of the setpoint drifting high. The licensee then sent the same breakers to Westinghouse for assistance in determining the root cause of the breaker's failures. Westinghouse examined some of the failed HFB breakers and informed the licensee in a May 22, 2003 letter that the cause of breaker failures was not distortion of the trip or the factors outlined by Exelon Power Labs. Westinghouse's expert opinion was that the breakers are tripping OOT high due to

hardening of the internal lubrication of the breaker. Westinghouse informed the licensee that this would occur due to the age of the breakers (20-30 years) and due to lack of periodic cycling/exercising of the MCCBs. Westinghouse recommended cycling these MCCBs 6 to 12 times a year.

The licensee informed the inspectors that the safety-related MCCBs are being tested in accordance with the requirements delineated in Preventive Corrective Maintenance (PCM) MA-AA-716-210-1001, "Motor Control Center/Multiple Pole Molded Case Circuit Breakers (MCCBs)," dated January 21, 2002. The PCM Template required that 480 Vac, 120 Vac and 125 Vdc MCCBs be trip tested every six years for critical breakers (used in Appendix R applications) and every 10 years for non-critical breakers. The PCM Template had no requirements for periodic cycling. The PCM Template stated that when determining breaker criticality, Appendix R issues and plant coordination of breakers needs to be considered. Non-safety related breakers may be critical based on their function (e.g., the breaker may be required to trip to protect a bus needed for post fire safe shutdown).

The PCM Template further stated, similar to large switchgear breakers, that MCCBs contain grease in their operating mechanism and if the breaker was not periodically cycled, this grease would harden and may prevent the breaker from operating when required. PCM Template for MCCBs was based on Nuclear Maintenance Assistance Center (NMAC) document NP-7410-V3, R1 and BWROG MCCB Committee Final Report, dated October 1996. Both documents require periodic cycling and testing of critical MCCBs to ensure that breakers will remain functional. The PCM further stated that the lubricant in the MCCB can be expected to act more like cement if a breaker is cycled scarcely at all in a period less than six to eight years. This period of inactivity will lead to high likelihood of binding and a failure to close or open. The PCM Template stated that it is recommended that all molded case circuit breakers should be cycled at least once per year to mix and distribute the lubricant. NEMA AB2 1984 and Westinghouse equipment qualification data sheets (EQDs) have recommendations for periodic cycling of MCCBs.

The inspectors noted that numerous operating experiences have been issued on hardened grease problems in MCCBs. Many failures were attributed to lack of lubrication in the mechanism. Cycling breakers 5 to 10 times allowed many of the breakers to successfully pass testing. Cycling the breaker removes oxidation and spreads lubricant over the moving parts. NRC Information Notice 93-64 documented that MCCB preventive maintenance practices (such as periodic manual exercising and testing), can mitigate the effects of aging and help ensure continued MCCB reliability. NRC IN 93-26 documented that an out put MCCB failed to close due to solidified grease in the breaker pivot points.

Westinghouse Technical Bulletin number TB-03-S, "Replacement Solutions for Obsolete AB-Deion (Classic Molded Case) Circuit Breakers and UL Testing Issues," dated June 24, 2003, informed licensees that the HFB breaker product line along with other classical product lines are planned to be phased out in 2003 and will no longer be available. In addition, the HFB molded case circuit breaker will be on "UL Hold" until further notice due to a problem identified with the mold used for making the external case on these breakers which could result in some minor cracking of the case after a breaker interrupts a high fault current. This condition is not considered to affect the performance or safe operation of the breaks, but will not allow the breakers to have the UL label.

The licensee stated that the trip points for all failed breakers, so far, had drifted high but were still within the coordination curves for the upstream MCC feed breakers. Therefore, the breakers are still capable of proving fault isolation and protection of the motor starter and feed cables from damage as a result of short circuits. All failed breakers were manufactured by Westinghouse and are type HFB magnetic only.

Analysis: The inspectors determined that the failure to establish a program and to manually cycle/exercise MCCB on a pre-established periodic basis was a performance deficiency warranting a significance evaluation. The inspectors concluded that the findings was greater than minor in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening," issued on June 20, 2003. The finding was considered to be greater than minor because the finding would become a more significant safety concern if left uncorrected. As a result of the MCCB trip points drifting too high or failing to trip, the breakers may fail to clear a load fault which may trip the upstream feed breaker resulting in the loss of the entire safe shutdown MCC. The finding is also associated with reliability of the auxiliary power system as a mitigating system for post-fire safe shutdown operation.

The inspectors completed a significance determination of this issue using IMC 0609, "Significance Determination Process (SDP)," dated April 21, 2003, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations," dated March 18, 2002. Since this finding did not result in loss of function per Generic Letter 91-18, this finding was considered to be very low safety significance (Green). This finding is assigned to the mitigating systems cornerstone for both units.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," required, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviation, defective material and equipment, and nonconformances are promptly identified and corrected. In June 2000, the NRC identified a Non-Cited Violation of the Braidwood Station's Facility Operating License for failure to periodically manually exercise, inspect, and test molded case circuit breakers to ensure proper operation as required by the Fire Protection Report. This NCV was documented in Inspection Report 50-456/00-06; 50-457/00-06. During this inspection, the inspector again identified that the licensee failed to establish a program and to manually cycle/exercise molded case circuit breakers (MCCBs) at the 120 Vac, 125 Vdc and 480 Vac voltage levels, on a pre-established periodic basis, as recommended by the vendor, by NEMA AB-4 and as required by the Braidwood Station's Safe Shutdown Analysis, FDRP 20-012, Section 2.4.1.6.1, to ensure proper breaker operation. Failure to have measures to correct conditions adverse to quality for a lack of exercise of MCCBs is considered a violation of 10 CFR Part 50, Appendix B, Criterion XVI. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program, this violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A of the NRC's Enforcement Policy. (NCV 50-456/457/03-05-02)

.6 Communications

The guidelines established by BTP CMEB 9.5-1, Section C.5.g, "Lighting and Communication," Paragraph (4), required that a portable communications system be

provided for use by the fire brigade and other operations personnel required to achieve safe plant shutdown. This system should not interfere with the communications capabilities of the plant security force. Fixed repeaters installed to permit use of portable radio communication units should be protected from exposure to fire damage.

a. Inspection Scope

The inspectors reviewed the adequacy of the communication system to support plant personnel in the performance of alternative safe shutdown functions and fire brigade duties. The inspectors also conducted a review to verify that sufficient channels were available to support safe shutdown implementation and that repeaters were powered by an emergency power source.

b. Findings

No findings of significance were identified.

.7 Emergency Lighting

The guidelines established by BTP CMEB 9.5-1, Section C.5.g, "Lighting and Communication," Paragraph (1), required that fixed self-contained lighting consisting of fluorescent or sealed-beam units with individual eight-hour minimum battery power supplies should be provided in areas that must be manned for safe shutdown and for access and egress routes to and from all fire areas.

a. Inspection Scope

The inspectors performed a walkdown of the alternative shutdown fire areas and the access/egress routes to verify that adequate emergency lighting existed.

b. Findings

No findings of significance were identified.

.8 Cold Shutdown Repairs

The guidelines established by BTP CMEB 9.5-1, Section C.5.c, "Alternative or Dedicated Shutdown Capability," Paragraph (5), required that equipment and systems comprising the means to achieve and maintain cold shutdown conditions should not be damaged by fire; or the fire damage to such equipment and systems should be limited so that the systems can be made operable and cold shutdown achieved within 72 hours. Materials for such repairs shall be readily available onsite, and procedures shall be in effect to implement such repairs.

a. Inspection Scope

The inspectors examined the licensee's ability to conduct cold shutdown repairs in accordance with the 72 hour requirement. The inspection team reviewed MA-BR-726-633, Rev. 0, the licensee's procedure for implementation of cold shutdown repairs. The inspectors assessed whether the licensee identified all the appropriate tools and equipment needed to complete the required cold shutdown repairs. The inspectors' review focused on ensuring that the tools and equipment were readily available onsite and designated solely for those repairs.

b. Findings

No findings of significance were identified.

.9 Fire Barriers and Fire Zone/Room Penetration Seals

The guidelines established by BTP CMEB 9.5-1, Section C.5.a, "Building Design," Paragraph (3), required that penetration seal designs be qualified by tests that are comparable to tests used to rate fire barriers.

a. Inspection Scope

The inspectors reviewed the test reports for three-hour rated barriers installed in the plant and performed visual inspections of selected barriers to ensure that the barrier installations were consistent with tested configuration.

b. Findings

No findings of significance were identified.

.10 Fire Protection Systems, Features and Equipment

The guidelines established by BTP CMEB 9.5-1 required that fire protection systems, features and equipment, specifically the passive fire protection features and fire detection system, were designed in accordance with Sections C.5.a and C.6.a.

a. Inspection Scope

The inspectors reviewed the material condition, operations lineup, operational effectiveness, and design of fire detection systems, fire suppression systems, and passive fire protection features. The inspectors reviewed deviations, detector placement drawings, carbon dioxide pre-operational test reports, and FHA reports to ensure that selected fire detection systems and carbon dioxide systems were installed in accordance with their design and that their design was adequate given the current equipment layout and plant configuration.

b. Findings

No findings of significance were identified.

.11 Compensatory Measures

a. Inspection Scope

The inspectors conducted a review to verify that adequate compensatory measures were put in place by the licensee for out-of-service, degraded or inoperable fire protection and post-fire safe shutdown equipment, systems, or features. The inspectors also conducted reviews to verify that short term compensatory measures were adequate to compensate for a degraded function or feature until appropriate corrective actions were taken.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (71152)

a. Inspection Scope

The inspectors reviewed the corrective action program procedures and samples of corrective action documents to verify that the licensee was identifying issues related to fire protection at an appropriate threshold and entering them in the corrective action program. The inspectors reviewed selected samples of condition reports, work orders, design packages, and fire protection system non-conformance documents.

b. Findings

- A finding relating to the resolution of problems associated with coordination calculation for 125 Vdc and 120 Vac for post-fire safe shutdown circuits was identified and is described in Section 1R05.3b of this report.

- A finding relating to the resolution of problems associated with MCCB periodic cycling was identified and is described in Sections 1R05.5b of this report.

4OA6 Meetings

.1 Exit Meeting

The inspectors presented the inspection results to Mr. T. Joyce and other members of licensee management at the conclusion of the inspection on July 11, 2003. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
M. Anjum, Fire Protection System Engineer
F. Beutler, Design Engineer
B. Boyle, Fire Marshal
S. Chingo, Fire Protection Engineer
C. Dunn, Site Engineering Director
C. Furlow, Electrical/I&C Engineer
T. Joyce, Plant Manager
F. Lentine, Design Engineer
G. O'Donnell, Fire Protection Engineer
D. Riedinger, Electrical/I&C Design Engineer
D. Roberts, Fire Protection Engineer
E. Stefan, NRC Coordinator

Nuclear Regulatory Commission
S. Ray, Senior Resident Inspector

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-456,457/03-05-01	NCV	Failure to Assess and Address Coordination Calculation Conclusions/Recommendations (Section 1R05.3b)
50-456,457/03-05-02	NCV	Molded Case Circuit Breakers Not Periodically Cycled/Exercised (Section 1R05.5b)

Closed

50-456,457/03-05-01	NCV	Failure to Assess and Address Coordination Calculation Conclusions/Recommendations (Section 1R05.3b)
50-456,457/03-05-02	NCV	Molded Case Circuit Breakers Not Periodically Cycled/Exercised (Section 1R05.5b)

Discussed

None

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

Condition Reports/ Action Requests

00148188; NRC Identified Paint Questions on Sherwin Williams Paint; dated March 7, 2003

00105657; Potential Common Mode Failure with Westinghouse HFB Breakers; dated November 25, 2002

Condition Report Initiated as Result of NRC Questions

00167020; Detector Spacing in Lower Cable Spreading Room; dated July 10, 2003

00167126; Classification of Heat Detectors in Upper Cable Spreading Room; dated July 10, 2003

Calculations

BYR 98-239/BRW 98-1287-E; Coordination Calculation for 125Vdc and 125 Vac Post Fire Safe Shutdown Circuites; dated October 1, 2001

BRW-97-0339-M; Braidwood Control Room Heat Up Evaluation; dated June 24, 1997

Engineering Changes

EC Number 0000340714 000; Change Existing Magnetic Trip Setting; February 5, 2003

Drawings

20E-2-4001A; Station One Line Diagram; January 16, 2002

20E-0-3907; Fire Detection, Main Floor at El. 451'-0; Revision R

20E-0-3910A; Fire Detection Zones 107, 141-155 & 207, 241-261, Miscellaneous Plans; Revision B

20E-8-99108; Fire Detection Zones 124, 142-156 & 224, 242-256, Miscellaneous Plans; Revision B

M-96; Diagram of Control Room HVAC System; Revision F
M-116; Diagram of Ess. & Noness. Switchgear, Misc. Elect. Equip. Rm. Ventilation System; Revision V

20E-2-4001A; Station One Line Diagram; Revision L

Series M-95; Auxiliary Building HVAC

Series M-96; Component Cooling Water System

Series M-120; Control Room HVAC System

Series M-122; Auxiliary Feedwater System

Series M-126; Essential Service Water System

Series M-135; Reactor Coolant System

Series M-136; Safety Injection System

Series M-138; Chemical & Volume Control System

Series M-137; Residual Heat Removal System

Pre-Operational Tests

BwSD-CO-61; Carbon Dioxide Fire Protection for Upper, Lower Cable Spreading, Electrical Cable Tunnel, Diesel Driven Aux. Feedwater Pump and Day Tank Rooms; dated December 19, 1987

Procedures

MA-AA-723-325; Molded Case Circuit Breaker Testing; Revision 0

0Bw0A PRI-5; Control Room Inaccessibility, Unit 0; Revision 101

2Bw0A PRI-5; Control Room Inaccessibility, Unit 2; Revision 100

BwAR 0-39-A4; Alarm Response Procedure, Unit 2; Revision 12

BwOP FP-100; Fire Response Guidelines; Revision 0

BwOP FP-100T7; Fire Response Guidelines; Revision 0

BwOP FP-100T27; Fire Response Guidelines; Revision 0

BwOP FP-100T35; Fire Response Guidelines; Revision 0

MA-BR-726-633; Installation of Post-Fire Cold Shutdown Emergency Cable

Specifications

DC-VC-01-BB; Design Criteria for Control Room HVAC System; dated December 28, 1979

SL-CS10; Coating System, Concrete, Concrete Masonry, or Metalwork, Two Coat, Water Base Epoxy, for Coating Service Level II Areas (Natural Concrete and Bare or Primed Metal); dated April 1, 1977

Test Reports

500-113; Results of E-84 Tests on Coating Systems Prepared by Carboline Company

Work Orders

00372523-01; Trip Test MCC Bkr-MCC 132x4 Cub H1; January 27,2003

98023436-01; 1API2EQ Imp. Test, Install Refurb. Brk; September 27, 2001

00371057-01; Trip Test MCC BKR-MCC 131x1 CUB M3 (Valve1SI8811A); April 1, 2003

980022954-01; Bus 131x FD to MCC 131x1 Bkr.-MCC-132x1 - F2; March 30, 2000

0535999-01; EM Contingency Revise Setting MCC; February 25, 2003

Miscellaneous documents

Westinghouse Technical Bulletin Number TB-03-05, Replacement Solutions for Obsolete AB-Deion (Classical Molded Case) Circuit Breakers and UL Testing Issues; dated June 24, 2003

CONA/47; M&M Protection Consultants Letter to Mr. Elias, Byron/Braidwood Station Fire Detection Design, Ionization Detectors

Ruskin Letter to NRC, Fire Damper Closure Under Air Flow, Ruskin Interlocking Blade Fire Dampers Model Numbers IBD-21, IBD-23, NIBD23; dated November 6, 1984

Sargent & Lundy Letter to Mr. Moerke, Notes of Telecommunication; April 15, 1988

Inadvertent Actuation of the Fire Suppression System; dated June 22, 1988

Fire Protection Documents

Braidwood Station Fire Plans; dated August 15, 2002

FDRP 20 - 012; Braidwood Safe Shutdown Analysis

LIST OF ACRONYMS USED

ac	Alternating Current
AEER	Auxiliary Electrical Equipment Room
AFW	Auxiliary Feedwater System
BTP	Branch Technical Position

LIST OF ACRONYMS USED

BwHP	Braidwood Electrical Maintenance Surveillance Procedure
BwOA	Braidwood Operating Abnormal Procedure
CFR	Code of Federal Regulations
CMEB	Chemical and Mechanical Engineering Branch
CR	Condition Report
CVCS	Chemical Volume Control System
dc	Direct Current
DRS	Division of Reactor Safety
EQDs	Equipment Qualification Data Sheet
FHA	Fire Hazard Analysis
FPP	Fire Protection Program
FPR	Fire Protection Report
GL	Generic Letter
IN	Information Notice
IMC	Inspection Manual Chapter
IPEEE	Individual Plant Examination of External Events
MCC	Motor Control Center
MCCB	Molded Case Circuit Breaker
MCR	Main Control Room
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
NMAC	Nuclear Maintenance Assistance Center
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulations
OOT	Out of Tolerance
PCM	Preventive Corrective Maintenance
PM	Preventive Maintenance
P&ID	Piping and Instrumentation Drawing
RSP	Remote Shutdown Panel
SDP	Significance Determination Process
SSA	Safe Shutdown Analysis
SSEL	Safe Shutdown Equipment List