U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-456/85054(DRS); 50-457/85052(DRS)

Docket Nos. 50-456; 50-457 Licenses No. CPPR-132; CPPR-133

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: Braidwood Station, Units 1 and 2

Inspection At: Braidwood Site, Braidwood, IL

Inspection Conducted: November 12 through December 5, 1985

Inspectors: R. Mendez — 1/27/86 Date

Z. Falevits — 1/27/86 Date

Approved By: C. C. Williams, Chief
Plant Systems Section — 1/27/86 Date

Inspection Summary

Inspection on November 12 through December 5, 1985 (Reports No. 50-456/85054(DRS); 50-457/85052(DRS))
Areas Inspected: Routine unannounced inspection of 50.55(e) reports; motor and penetration overcurrent protection relays; testability of molded case breakers; instrument calibration and BCAP discrepancy evaluations. The inspection involved a total of 118 inspector-hours by two NRC inspectors. IE Inspection Procedures reviewed during this inspection included 30703B, 099020B, 51056B, 51066B,52053B, 52054B, 52064B and 52065B.
Results: Of the areas inspected no violations or deviations were identified; however, some unresolved and open items were identified which require further NRC inspection.

DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

*L. M. Kline, Project Licensing Supervisor
*G. M. Orlov, BCAP Assistant Director
*N. Tomis, Project OAD Supervising Engineer
*K. Faber, Project OAD Assistant Supervisor
*N. A. Schryer, Project Construction Engineer
P. L. Barnes, Licensing Engineer
D. L. Ceichet, Licensing Engineer
+J. F. Phelan, Project Field Engineering Supervisor
T. Ronkonske, Project Construction Engineer
+J. J. Dennehy, Lead Electrical Engineer
N. N. Kaushal, BCAP Director

Sargent and Lundy Engineers (S&L)

*T. B. Thorsell, Senior Electrical Project Engineer
D. C. Patel, Supervising Design Engineer
*D. P. Galanis, Electrical Project Engineer
*J. D. Regan, Electrical Project Engineer
*H. McCullough, Quality Assurance Engineer
*T. J. Ryan, Structural Project Engineer
B. A. Knobloch, Senior Structural Engineer
A. Morros, Quality Assurance Engineer
R. W. Hooks, Assistant Head Structural Engineering Division

*Denotes those attending the December 4, 1985 exit interview.

+Denotes those attending the December 5, 1985 exit interview at the Sargent and Lundy office.

The inspector also contacted and interviewed other licensee and contractor personnel during this inspection.

2. Action on 10 CFR 50.55(e) Items

a. (Closed) 10 CFR 50.55(e) (456/79002-EE): "Undetectable Failure in Engineered Safety Feature Actuation System (ESFAS)." On November 7, 1979, Westinghouse identified an undetectable failure that could have potentially affected circuits associated with Engineered Safeguards. A failure analysis by the licensee assumed a failure of the circuit in both redundant protective trains and, consequently, automatic initiation of the protective function would be lost under certain conditions. This problem pertained to the P-4 permissive, associated with the reactor trip and reactor trip bypass breakers, which provides an interlock in the ESFAS to control manual reset. Westinghouse instruction, Attachment (NS-TMA-2150), recommended incorporating tests to check the operability of the P-4 interlock contacts. The

instructions required that the testing sequence be followed for each train of Solid State Protection System (SSPS), with the plant in shutdown and the SSPS in normal operation. The licensee has incorporated the instructions for testing the P-4 contacts in Braidwood surveillance Procedure 1BWOS 3.2.1-12.

b. (Closed) 10 CFR 50.55(e) (457/82003-EE): "Emergency Diesel Generator Field Relay Failure." The licensee had previously identified relays in the diesel generator control panels that did not have adequate DC interrupting rating for their designed use. Proposed corrective action was to replace the existing 120V AC Voltage Regulator (VR) relays with KU series 125V DC relays. During a previous inspection the inspector observed the relays to have a rating of 110V DC and not 125V DC as stated in the licensee's final report. Subsequently, the manufacturer of the VR relays issued a letter to the licensee addressing the acceptability of the KU series 110V DC VR relay. The letter stated that the minimum pick-up and drop out voltages determined during actual testing of the relay were adequate to eliminate voltage transients and possible spurious tripping. On October 25, 1985, the licensee issued their amended final report concerning the acceptability of the 110V DC VR relays. The letter stated that the relays were tested and qualified for their intended use and consequently, considered acceptable.

c. (Closed) 50.55(e) (457/82004-EE): "Undetectable failures may exist with Westinghouse on line circuits in the Solid State Protection System (SSPS)." During a review of schematic diagrams of the the SSPS, Westinghouse uncovered a potential undetectable failure with the testing circuits. Field Change Notices (FCN's) CDEM-10589A and CCEM-10609A were issued to modify a portion of the SSPS Circuit to resolve the undetectable failure in the on-line testing circuit. A wire list affecting Westinghouse Drawing No. 2390A27 was issued to delete wires numbered 13-011, 13-023, 13-012 and 13-022 and to add wire number 13-022 in the Output Relay Test Panel. The inspector reviewed QC inspection records of the modification and verified the change in the field at one of the relay panels (2PA10J). Additionally, S&L schematic drawings numbered 20E-2-4030EF58 and 20-E-2-4030EF09, Revision 9, have been revised to reflect the modification.

d. (Open) 10 CFR 50.55(e) (456/83009-EE; 457/83009-EE): "Failures were identified in the Westinghouse 7300 Process Protection System instrumentation." During seismic testing of the Temperature Channel Test (NTC) card, contact bounce was experienced in the mercury relay utilized on this card. Westinghouse determined that this type of relay would experience trip delays due to the intermittent relay contact during a seismic event. According to a Westinghouse Engineer, a replacement relay has been developed and will replace the existing mercury relay on the NTC cards. This item remains open pending further inspection following relay replacement.

e. (Open) 10 CFR 50.55(e) (456/83013-EE; 457/83013-EE): "Westinghouse A-200 MCC's Overload Blocks." During testing of Westinghouse Motor Control Centers (MCC's) it was discovered that some of the motor starters were tripping outside of the acceptance criteria specified by Westinghouse instructions. It was determined that deficiencies existed in the A-200 MCC ambient compensated thermal overload relay blocks for sizes 0,1, and 2 starters. Westinghouse subsequently furnished replacement blocks for all Unit 1 MCC's. In addition the licensee had developed a maintenance procedure to test the overload blocks to determine whether they trip within the specified times. The licensee has stated however, that not all the overload blocks have been replaced. The sizing of thermal overloads is discussed in Paragraph 3 of this report. This item remains open pending review of the final corrective action.

3. Review of Electrical Work Activities

a. Overcurrent Motor Protection and Protection of Penetrations

The inspector conducted an as-built inspection and design document review to ascertain whether the electrical components and system configuration conforms to the latest applicable design and regulatory requirements. The following functional areas were selected for review:

- Methodology and procedure for the selection and sizing of thermal overload relays and the licensee's conformance to the requirements of Regulatory Guide 1.106, Regulatory Position e.2.

- Methodology and procedure for sizing 480V Motor Control Center breakers and determine the magnetic trip set points for motor operated valves, continuous motors and heaters.

- Conformance with the requirements of Regulatory Guide 1.63-1978, and IEEE Standard 317-1976 as related to the electrical design of the electric penetration assemblies in containment.

(1) The inspector examined various components and systems associated with the MCC's, including fuse, thermal overload, and circuit breaker ratings; trip set points, sampling of terminal blocks for lug crimping or wire termination attributes; and verification of the requirements of design drawings against the as-built configuration. The following installed items were observed in the field:

MCC	Service	Control Fuses	Thermal Overload	Contactor Size	Breaker Size	Breaker Trip Setting
132X3-C4	Valve 0SX063B	3A	FH08	1	3	Low
132X1-B4	Valve 1SX034	3A	FH28	1	5	7
131X1A-K2	Valve 1CS019A	3A	FH14	1	10	Low
131X1A-Q1	Valve 1SI8812A	3A	FH45	2	40	Fixed
131X1A-M2	ECCS ISOL Valves	1½A, 1½A, 6A	Pulled Out	3	150	Fixed
131X1A-M3	Valve 1SI8811A	3A, 3A,	FH42	1	25	6
131X1A-M4	Valve 1CC9413A	3A	FH26	1	5	7
131X1A-N1	Valve 1SI8920	3A	FH26	1	5	4
131X1A-N2	Valve 1SI8814	3A	FH26	1	5	5
131X1A-P1	Valve 1SI8802A	3A	FH30	1	10	Low
131X1A-P2	Valve 1SI9909A	3A	FH45	2	40	Fixed
131X1A-P3	Valve 1SI8806	3A	FH30	1	10	Low
131X1A-P4	Valve 1SI8835	3A	FH30	1	5	10
131X1A-Q1	Valve 1SI8812P	3A	FH45	2	40	Fixed
131X1A-Q2	Valve 1SI8840	3A	FH54	2	70	Fixed
131X2-G2	Valve 1RC8001B	3A, 3A	FH46	2	40	Fixed
131X2-H2	Valve 1RC8001B	3A	FH46	2	-	-
131X2-G3	Valve 1RC8001C	3A, 3A	FH45	2	40	Fixed
131X2-H3	Valve 1RC8001C	3A	FH45	2	-	-
131X2-G4	Valve 1RC8001D	3A, 3A	FH45	2	40	Fixed
131X2-H4	Valve 1RC8001D	3A	FH45	2	-	-
131X2-G1	Valve 1RC8001A	3A, 3A	FH45	2	40	Fixed
131X2-F1	Valve 1VQ002A	3A, 3A	Pulled Out	2	15	Fixed
131X2-D3	Valve 1CC9416	3A, 3A	FH25	2	15	Fixed
131X2 D4	Valve 1CC9438	3A, 3A	FH28	2	15	Fixed
131X2 C4	Valve 1RC8003D	3A, 3A	FH32	2	15	Fixed
131X2 C5	Valve 1RC8003A	3A, 3A	FH32	2	15	Fixed
131X2 B1	Valve 1RH8701A	3A, 3A	FH32	2	15	Fixed
131X2 B4	Valve 1RH8702A	3A, 3A	FH36	2	15	Fixed
131X2 A2	Valve 1SI8808D	3A, 3A	FH52	2	15	Fixed

The inspector reviewed the component data noted above against the following design documents:

(a) Operational Analysis Department (OAD) Electrical Data Form No. 1 - motors, data sheets.

(b) Key Diagram - 480V Auxiliary Building ESF MCC 131X2 and 131X2A drawing 20E-1-40083, Revision "Y".

(c) Key Diagram - 480V Auxiliary Building ESF MCC 131X2.

(d) Tabulation of trip settings - 480V Auxiliary Building ESF MCC 131X1 and 131X1A drawings 4008C and D, Revisions V and P respectively.

(e) Tabulation of trip settings - 480V MCC Auxiliary Building ESF MCC 131X2 and A drawing 2DE-1-4008F, Revision "T".

(f) Various applicable schematic and correction diagrams.

(2) On December 5, 1985, the inspectors conducted a design review at the AE's engineering offices. The following design documents were reviewed and were found acceptable:

(a) Sargent and Lundy Calculation 4391/19-AN-10 dated June 18, 1984. The purpose of this calculation was to determine the maximum and minimum fault current available in the various safety-related circuits, in order to coordinate the thermal overload relay and magnetic breakers for electric motors on motor operated valves.

(b) Sargent and Lundy Calculation 4391/19-AQ-17 dated October 31, 1983. This calculation was performed to calculate the maximum fault currents at the reactor containment electrical penetrations.

(c) Sargent and Lundy Calculation 4391/19-AQ-18 dated October 28, 1980. The purpose of this calculation was to identify the penetration fault current time capability.

(d) Calculation 4391/19-AQ-19 dated October 20, 1985. This calculation provided the following: (1) Identified the primary and backup overcurrent protection devices provided for each typical circuit that penetrates the containment and (2) Demonstrated that the backup overcurrent protective devices will trip to interrupt the maximum fault current available prior to exceeding the penetration conductor capacity.

(e) Sargent and Lundy Thermal Overload Relay Sizing Procedure dated April 15, 1983.

(f) Sargent and Lundy Justification for Thermal Relay Sizing Procedure for Valve Actuator Motors (addresses requirements of Regulatory Guide 1.63).

(g) Sargent and Lundy Design Information Transmittal DIT-EPED-009 dated August 6, 1984.

(3) The following discrepancies were identified by the NRC inspector during this inspection in the field:

(a) Compartment Q1 of MCC 131X1A contained a control fuse rated 3A, while the applicable schematic diagram 20E-1-4030SI15, Revision "F" indicated this fuse to be 6A. In addition, the three feed conductors terminated at the starter were observed to be nicked.

(b) Compartment M2 of MCC 132X4-A contained a control fuse rated 3A, while the applicable schematic diagram 20E-1-4030SI1S, Revision "F" indicated this fuse to be 6A.

(c) Schematic Diagram 20E-1-4030CS04 contains a single 3A fuse for each Containment Spray Pump (1A and 1B) Sump Suction Valve control circuit which contain electrical valve interlocks inside the containment. The control cables for these pumps are routed through the electrical penetrations and are required by Regulatory Guide 1.63-1978, to be protected against maximum short circuit current for these circuits in order to protect the integrity of the penetration. All other control circuits routed through the electrical penetrations, reviewed by the inspector, contained two control fuses in series in each circuit. The Sargent and Lundy engineers indicated that a worst case analysis was performed for each of the different circuits that contained two control fuses in series, however, no analysis was performed before this inspection on the two control circuits that contained only one fuse in the control circuit.

(d) OAD engineers determine the correct thermal overload size and the magnetic trip set point for the magnetic circuit breakers. The inspector noted that whenever the Full Load Ampere value (FLA)X10 for a valve or pump falls below the low set point specified for a specific breaker size (as shown on Table C of the OAD "MCC Overload and IT Settings" document, dated July 7, 1983) the OAD engineer selects the low set point for the specific breaker. This is demonstrated by the magnetic trip settings for Pump 1SX01PB-C and Valve 1SX150B. For instance, when a size 10 breaker is installed, the low set point specified in Table C, for a size 10 breaker, is 35A, even if the OAD engineer determines the (FLA)X10 to be below 35A, the low set point (35A) is still specified.

(e) During this inspection the inspector observed fuses and overload heaters, either removed from the compartments or lying on the bottom of the MCC compartment. "Out of Service" tags were not placed on these compartments nor were there any administrative control procedures available for review, addressing the removal or replacement of fuses or thermal overload heaters. The OAD engineer indicated that it is up to the engineer to decide where he should place the fuses or thermal overload when removed or replaced. This practice appears to be inadequately controlled and may lead to the replacement of the wrong fuse into the incorrect fuse holder and possible damage to the overload heater elements.

(f) OAD Electrical Data Form No. 1 - Motor Sheet is utilized by the OAD engineer to document the motor nameplate data, and all electrical tests performed; such as, motor and cable insulation resistance test, operability tests of control

circuits, motor rotation test, and motor running amp test. This form is also used to document the calculated thermal overload size, the calculated breaker trip setting, overload relay setting, and the torque switch setting. The only signature found on this form is that of the OAD engineer who performed these calculations and tests. No verification or QC signatures were noted on this form to indicate that all calculations and tests have been reviewed and/or witnessed.

The inspectors were informed by the Sargent and Lundy engineers that a comprehensive engineering review is presently being conducted to determine if additional deficiencies such as those noted above in Items 3.a.(3)(b) and 3.a.(3)(c) exist. The results of this review will be transmitted to Region III when completed. Pending licensee action and NRC review Items 3.a.(3)(a) through 3.a.(3)(f) are considered unresolved (456/85054-01; 457/85052-01).

b. Protective Overcurrent Relays

The inspectors reviewed records for protective overcurrent relays 50 and 51, for the 4K motors. The calibration and set point data were obtained from Relay Setting order sheets issued by the licensee's System Planning Department and Station Electrical Engineering Department. The following data is supplied to the licensee's Operational Analysis Department (OAD):

- Operating Tap
- Actual Time Lever
- Multiple of Tap Current
- Tap used for Timing
- Timing Amps
- Timing of the Overcurrent Trip Point

The OAD engineer verifies the above set points against the typical time curves provided in Westinghouse manual instructions I.L.41-1000. The OAD engineer selects different multiples of tap value current to establish two points along the overcurrent time curve. The inspector verified that overcurrent relays were set in accordance with the established values for the following 4KV motors:

Residual Heat Removal Pump 1A (1RH01PA)
Residual Heat Removal Pump 1B (1RH01PB)
Safety Injection Pump 1A (1SI01PA)
Safety Injection Pump 1B (1SI01PB)
Containment Spray Pump 1A (1CS01PA)
Containment Spray Pump 1B (1CS01PB)
Centrifugal Charging Pump 1A (1CV01PA)
Centrifugal Charging Pump 1B (1CV01PB)
Auxiliary Feedwater Pump 1A (1AF01PA)
Auxiliary Feedwater Pump 1B (1AF01PB)

c. Testability of Molded Case Breakers

Amendment 37 of the Braidwood FSAR Section A1.75 titled, "Physical Independence of Electric Systems, states that devices actuated by fault current may be used as isolation devices (it is noted that Regulatory Guide 1.75 does not consider a device actuated by fault current as an isolation device). The FSAR further states that (where practical) the licensee will provide two interrupting devices in series actuated by fault current. The interrupting devices will be (1) Class 1E and periodically tested to verify coordination. On September 8, 1985, in a licensee internal letter from Mr. G. E. Petersen to Mr. D. Elias, the licensee stated their position regarding questions by the licensee's maintenance staff for developing a DC molded case circuit breaker testing program. The letter references the section of the FSAR referenced above. The letter states in part, "Rather than encumber the Byron and Braidwood Stations with testing required by the FSAR commitment it is recommended that the design of the 125V DC feeds to non-safety loads be modified to eliminate the need for testing. This can be accomplished by installing two sets of fuses in the interconnection between the safety related bus and non-safety related distribution panel. The fuse would be installed in parallel with the existing 225 amp breaker. The breaker would be operated normally open and used only as a fuse by-pass during fuse maintenance (if required)." The 225 amp breaker mentioned above feeds other non-1E loads through individual molded case breakers. Presently, the licensee meets their FSAR commitment and they have not formally indicated whether they are going to amend Section A1.75 of the FSAR. This issue will be discussed further with the licensee during subsequent inspections.

4. Review of Instrument Calibration Activities

The inspector observed the calibration of Summing Amplifier Instrument 1TY-0422H, which is part of the overtemperature $\Delta T/T$ Instrumentation for Loop 1B. The five inputs, T-hot, T-cold, flux up, flux down and pressurizer pressure, were observed to be properly connected per Braidwood surveillance Procedure BWIS 3.1.1-200 and loop schematic drawing 6E-1-4031RC03. The outputs of the instrument card at the main control board indicator were determined to be within acceptable tolerances. Additionally, the measuring and test equipment used in calibrating Instrument 1TY-0422H were verified as having current calibration stickers.

During a second check of the outputs on the computer printout, the outputs of Instrument card 1TY-0422H were determined to be outside the allowable ranges. The instrument mechanics involved with the above calibration then investigated and verified the setpoints for all the components in the $\Delta T/T$ Instruments for loop "B". The instrument mechanics determined that the lead/lag derivative card Model Number 2837A18G01 was defective. The measured outputs of this card were out of calibration approximately 50% at some of the selected check points. The instrument mechanics issued

Instrument Discrepancy Report (IDR) RC-200 to have the defective card replaced. The instrument mechanics replaced the defective card and calibrated the replacement card. The instrument mechanics subsequently checked the instrument loop to verify that the desired outputs were within acceptable tolerances. No discrepanacies were noted in these activities.

5. BCAP Discrepancy Evaluations

The licensee developed the Braidwood Construction Assessment Program (BCAP) in order to provide an overall assessment of the quality of safety related construction work at Braidwood. The objective of BCAP was to ensure that (1) no unidentified or unaddressed programmatic construction problems existed (2) onsite contractor's safety-related procedures addressed all applicable design and regulatory requirements and (3) corrective actions have been adequately implemented and documented for identified construction activities. The implementation of BCAP disclosed a number of discrepant items. These discrepancies were potential violations or deviations from design drawings and specifications. Evaluations were performed by comparing the discrepancies with design parameters, tolerances and design margins using documented engineering judgement or calculations. Some of the discrepancies required simple evaluations that the licensee concluded would have negligible effect on an items ability to perform its safety-related function. Some of the other discrepancies required detailed evaluations. The licensee categorized the reinspection discrepancies as design significant, notable and insignificant. The licensee defined design significant as a discrepancy which impaired the item's ability to perform its safety-related design function. A notable item was a discrepancy which reduced the item's capacity by 10% or more but would not impair the item's ability to perform its safety-related function. An insignificant item was a discrepancy which reduced the item's capacity by less than 10%. In most cases a discrepancy which reduced an item's capacity was determined by comparing the quantitative values of the as-built construction capacity with the as-designed configuration capacity. The reduction in capacity "R" value was calculated by dividing the as-built capacity by the as-designed capacity. Similarly the margin of safety "S" value was calculated by dividing the as-built capacity by the allowable capacity. In the electrical area, the licensee determined that of the total number of observations approximately 70% were insignificant, 30% were notable and none were design significant.

The inspector reviewed the following observations and calculation in the electrical area which included raceway, raceway hangers, cables, electrical equipment and instrument sensing lines:

These calculations were reviewed for technical methodology, completeness and proper references. During a review of the calculations the inspector identified and discussed the following observations with S&L engineers:

BCAP Observation No.	Calculation No.
CSR-I-E-COH-XXX-23	19.3.1.9.2.XXX.48
CSR-I-E-COH-015-03	19.3.1.9.2.15
CSR-I-E-COH-119-01	19.3.1.9.2.XXX.119
CSR-I-E-CND-001-02	19.BD-01
CSR-I-E-CBP-XXX-163	19.3.1.10.2.XXX.163
CSR-I-E-EIN-025-02	19.3.1.12.2.25
CSR-I-E-EIN-027-01	19.3.1.12.2.27
CSR-I-E-EIN-028-01	19.3.1.12.2.28
CSR-I-E-EIN-033-01	19.3.1.12.2.33
CSR-I-E-EIN-104-01	19.3.1.12.2.104
CSR-I-E-EIN-112-02	CQD-230215
CSR-I-E-EIN-112-03	19BD-08
CSR-I-E-I-M-029-02	19.3.1.24.2.30
CSR-I-E-I-M-110-09	19.3.1.24.2.110

a. Observation CND-001-02 identified a loose fitting on a liquid tight flexible conduit fitting. Calculation 19BD-01 was based on the disconnected flexible conduit on the cable being subjected to forces in tension and sidewell pressure. No consideration had been given to the fitting providing the liquid tight barrier. The licensee stated that in almost all instances the liquid tight flexible conduit was provided for convenience and not to provide liquid tight barriers. However, the licensee issued an addendum to CECo nonconformance report (NCR) 6080 on October 8, 1985, which required that during area walkdowns the looseness of flexible conduit connections be checked and tightened if required.

b. The inspector discussed with the licensee whether discrepancies found outside the allowable tolerances were to be incorporated into as-built drawing. Several BCAP observations discussed with the licensee at the Braidwood site indicated that in some cases the BCAP engineer did not recommend that drawings be updated to reflect the as-built condition. Normally a Field Change Request (FCR) is issued by the site to initiate a drawing change. Some of the observations which were determined to be outside the allowable tolerances did not result in the recommendation of FCR's to S&L. Discussions with S&L indicate they are in the process of formulating acceptance criteria in this area. This matter is open pending further review (456/85054-02; 457/85052-02).

6. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed by the inspector and which involve some action on the part of the NRC or licensee or both. An open items disclosed during the inspection is discussed in Paragraph 5.b.

7. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. Unresolved items disclosed during the inspection are discussed in Paragraphs 3.a.(3)(a) through 3.a.(3)(f).

8. Exit Interview

The inspector met with licensee representatives denoted in Paragraph 1 during the inspection on December 4 and 5, 1985. The inspector summarized the scope and results of the likely content of this inspection report. The licensee acknowledged the information and did not indicate that any of the information disclosed during the inspection could be considered proprietary in nature.