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U-602757
4F.190

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Docket No. 50-461

Mr. A. Bill Beach
Regional Administrator, Region III
U. S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, Illinois 60532-4351

Subject: Clinton Power Station
Circuit Breaker Operability Assurance

Dear Mr. Beach:

This letter is a follow-up to extensive verbal and written communication with you and your inspection staff regarding the operability of safety-related circuit breakers at Clinton Power Station (CPS). Prior to startup from the current outage, all in-service safety-related circuit breakers will have been replaced with refurbished breakers or inspected and tested. This plan is detailed in the attachment and will provide assurance that these breakers will perform their intended safety functions and meet operational requirements. The scope of the plan has been expanded since it was originally issued as described in IP letter U-602721 dated April 14, 1997.

The detailed inspection and testing plan will provide assurance of continued operability of the ABB 480 volt, GE 4160 volt Magne-Blast, and Westinghouse 4160 and 6900 volt safety-related circuit breakers at CPS. Industry and vendor experience and knowledge have been used to develop and implement the plan and will be used to monitor and evaluate the results. Contingency plans are in place to expand the required scope of work based on information gained during the refurbishment, inspection, and testing activities. As noted above, at the conclusion of the implementation of this plan, each of the in-service safety related circuit breakers will either have been recently replaced, refurbished, or tested and inspected. Also, prior to placing the circuit breaker back into service, post-maintenance functional testing will have been performed to ensure proper circuit breaker operation. The detailed plan, including the reason for selection of the specific inspection areas, is provided in the attachment to this letter.

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CPS is committed to continued safe and reliable operation of the plant and these actions support that goal.

I will inform you when the activities described in the attached plan are complete.

Sincerely yours,

Wayne D. Romberg
Assistant Vice President

MDS/krk

Attachment

cc: J. L. Caldwell, USNRC, Region III
G. C. Wright, USNRC, Region III
M. A. Ring, USNRC, Region III
NRC Resident Office, V-690
Document Control Desk, USNRC
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ABB 480 Volt Circuit Breaker Inspection and Testing Plan

Population: 33 safety-related circuit breakers (16 Division I, 17 Division II)

Summary: 21 refurbished (4 Division I, 17 Division II), 12 inspected and tested (Division I breakers only)

Actions to Determine Assurance of Circuit Breaker Performance

1. Install refurbished circuit breakers in twenty-one of the thirty-three circuit breaker cubicles. Completion of this refurbishment, which started in 1995, will finish the refurbishment of all Division II circuit breakers.

2. Test and inspect all safety related circuit breakers that are not replaced with refurbished breakers. This ensures that every ABB breaker has, at a minimum, been tested and inspected prior to start-up from the current outage.

   Note: Originally all circuit breakers were not going to be tested and inspected but based on refurbishment as-found testing results the scope of the inspection was expanded to include all circuit breakers.

3. ABB and Nuclear Station Engineering Department (NSED) personnel will inspect and conduct low voltage trip and close test on fifteen (14 safety related, 1 non-safety related) CPS circuit breakers presently awaiting refurbishment. At least three of those circuit breakers will be disassembled to gather additional data on the as found condition of the circuit breaker. An evaluation of these breakers will be performed by ABB, Duke Engineering and Services, and NSED personnel.

4. ABB will perform an evaluation and provide a written assessment of the condition of circuit breakers they have refurbished to date.

5. Duke Engineering and Services personnel will conduct a detailed internal examination of one non-safety related circuit breaker and provide an evaluation of the condition of that circuit breaker.

6. NSED will evaluate the generic applicability of the data obtained from the refurbishments and inspections conducted, and with input from ABB and Duke Engineering and Services, provide an engineering evaluation of the future operability of the circuit breakers that have not been refurbished.

Basis for Reasonable Assurance of Circuit Breaker Operability

The CPS ABB Inspection Plan was derived from the CPS 480V ABB Breaker Standard Refurbishment Specification and includes those critical attributes that demonstrate satisfactory breaker performance and material condition. All safety-related in-service circuit breakers that have not been recently refurbished will have this checklist performed to ensure continued breaker operability. Inspection items in the checklist include:

- Low voltage functional and timing tests. (This tests each circuit breaker at lowest possible control voltages, below minimum postulated battery voltage at the bus, and produces a minimal amount of force on the operating mechanism. The purpose of this test was to detect the early stages of problems with binding or sticking in the operating mechanism of the circuit breaker.)

- Nominal voltage functional and timing tests. (This test compares time values with vendor specifications and also correlates low voltage time values to nominal voltage testing values obtained at CPS. This test ensures that the circuit breaker functions properly under normal control voltage conditions).

- Trip device tests. (This verifies proper operation of trip device operating parameters, electrical circuitry, and mechanical linkages of the mechanism.)

- Lubrication inspections of critical components. (Inspection of pivots, latches, and rollers to identify lubrication related conditions that could impact the function of the mechanisms. Grease consistency, color, dirt contamination, non-standard type lubricants and free movement of the components are documented and corrected as necessary).

- Tripper bar load test. (This test verifies manufacturer specification of the required tripper bar load and ensures no binding is present on a main tripping component).

- Visual inspections. (Identifies physical discrepancies that would potentially impact breaker operation; items inspected include: wiring, hardware, c-clips, etc.).

This checklist was reviewed by Duke Engineering and Services (an independent consultant), who also validated the checklist by performing a complete disassembly of a CPS non-safety ABB 480V circuit breaker. During a recent inspection and refurbishment effort by ABB (Houston, TX), the checklist was further validated as being an adequate tool for providing reasonable assurance of overall material conditions and operability of the circuit breakers. If discrepancies are noted during the inspection and testing activities which cannot be satisfactorily resolved, the affected circuit breaker will be replaced with a refurbished circuit breaker prior to plant startup.

General Electric 4160 Volt Circuit Breakers
Inspection and Testing Plan

Population: 5 safety-related circuit breakers

Summary: 1 refurbished, 1 operating mechanism refurbishment, 3 inspected and tested

Actions to Determine Assurance of Circuit Breaker Performance

1. Install one recently refurbished spare circuit breaker in the MCC main feed cubicle. Note: Based on inspection and test results, one additional circuit breaker was replaced with a circuit breaker that had its operating mechanism refurbished.

2. Perform a detailed inspection and test of the three remaining circuit breakers. The tests performed included a low voltage close and open test.

3. General Electric and Nuclear Logistics Incorporated (NLI) will review the inspection and test plan and evaluate the adequacy of the plan for determining circuit breaker condition.

4. General Electric and NLI will review inspection and test results and evaluate the condition of the three circuit breakers that were not replaced with refurbished (partially or fully) circuit breakers but were inspected and tested.

5. NSED will evaluate the generic applicability of the data obtained from the refurbishments and inspections conducted, and with input from NLI and GE, provide an engineering evaluation of the future operability of the circuit breakers that have not been refurbished.

6. Within six months of startup from the current refueling outage replace the four remaining circuit breakers with fully refurbished circuit breakers.

Basis for Reasonable Assurance of Circuit Breaker Operability

The inspection and testing plan for GE Magne Blast circuit breakers was derived from a combination of GE literature, CPS history data, EPRI/NMAC user group literature, industry peer procedures, and industry feedback documents. Both Duke Engineering and Services and Nuclear Logistics Inc. (an independent consultant on GE circuit breakers and the CPS GE circuit breaker refurbishment vendor) reviewed the inspection plan and associated CPS procedures and assisted in the testing and inspection.

The CPS GE circuit breaker inspection checklist includes critical attributes that demonstrate breaker performance. Inspection items in the checklist include:

- Low voltage functional and timing tests. (This tests each circuit breaker at lowest possible control voltages, below postulated minimum battery voltage at the bus, and produces a minimal amount of force on the operating mechanism. The purpose of this test is to detect the early stages of problems with binding or sticking in the operating mechanism of the circuit breaker.)

- Nominal voltage functional and timing tests. (This test compares time values with vendor specifications and also correlates low voltage time values to nominal voltage testing values obtained at CPS. This test ensures that the circuit breaker functions properly under normal control voltage operations).

- Mechanism physical checks. (This verifies that the trip and close mechanical linkages of the mechanism are not binding).

- Checks for applicability of various industry identified problems. (Checks micro and auxiliary switches for low resistance to mitigate electrical operation failures, and mechanism component degradation such as prop tip chips, broken arcing contact braids, cotter pin breakage, secondary contact block breakage, loose bolts on charging motor, striker plate weld cracks, loose set screws, etc.).

- Lubrication inspections of critical components. (Inspection of pivots, latches, and rollers to identify lubrication related conditions that could impact the function of the mechanisms. Lubrication consistency, color, dirt contamination, the presence of non-standard types of lubricants, and free movement of the components are documented and corrected as necessary).

- Preventive maintenance inspections. (Reviews for proper vendor specified gaps, wipes, clearances, and distances, megger and ductor testing to assure that vendor recommended maintenance parameters are met).

- Extensive breaker cycling (25 open/close cycles) for additional assurance of repeatability.

If discrepancies are noted during the inspection and testing which cannot be resolved, the affected circuit breaker will be replaced with a refurbished breaker prior to plant startup.

Westinghouse 4160/6900 volt Circuit Breakers
Inspection and Testing Plan

Population: 26 safety-related (includes 4 Model DVP and 22 Model DHP [2 DHPs are spares])

Summary: 1 refurbished, 16 detailed inspection and test (includes 1 not in-service spare), 8 abbreviated inspection and test, 1 cannibalized spare (not in-service, not refurbished or inspected or tested)

Actions to Determine Assurance of Circuit Breaker Performance

1. Westinghouse and Duke Engineering and Services will review the inspection and test plan and determine the adequacy of the plan for assessing the condition of the circuit breakers.

2. Perform a detailed inspection, using the inspection and test plan, of sixteen circuit breakers (twelve model DHP and four model DVP).

3. Perform an abbreviated inspection and test of eight model DHP circuit breakers that do not undergo the detailed inspection and testing plan. This abbreviated inspection includes an inspection for the mechanical condition of the cotter pins and a low voltage trip and close test of circuit breakers. The two circuit breakers that will not be inspected are a spare circuit breaker and a circuit breaker that has been refurbished within the last two years.

4. Westinghouse, Duke Engineering and Services, and NSED will review the inspection and test results obtained from the inspection and test program and evaluate the future operability of the circuit breakers based on this information.

Basis for Reasonable Assurance of Circuit Breaker Operability

The CPS Inspection Plan for Westinghouse Circuit Breakers was derived from Westinghouse literature, CPS history data, EPRI/NMAC user group literature, industry peer procedures, and industry feedback documents. Duke Engineering and Services reviewed the inspection plan and associated CPS procedure, and assisted in the conduct of the inspections and tests.

The CPS Westinghouse circuit breaker inspection checklist includes critical attributes that demonstrate breaker performance. Inspection items in the checklist include:

- Low voltage functional and timing tests. (This tests each circuit breaker at lowest possible control voltages, below minimum postulated battery voltage at the bus, and produces a minimal amount of force on the operating mechanism. The purpose of this test is to detect the early stages of problems with binding or sticking in the operating mechanism of the circuit breaker.)

- Mechanism physical checks. (This verifies trip and close mechanical linkages of the operating mechanism are not binding, verifies no excessive binding in main pole units).

- Checks for applicability of industry identified problems (checks for motor cut-off switch problems, levering in device cracks).

- Lubrication inspections of critical components. (Inspection of pivots, latches, and rollers to identify lubricated related conditions that would impact the function of the mechanisms. Lubrication consistency, color, dirt contamination, the presence of non-standard types of lubricants, and free movement of the components are documented and corrected as necessary).

- Cycling of the circuit breaker for additional assurance of repeatability (5 open/close cycles).

Most of the testing of the safety-related Westinghouse breakers is complete, and units have been returned to service. In addition to successful as-found and as-left functional tests on these breakers, extensive preventive maintenance was performed on critical mechanical mechanisms to ensure questionable lubrication issues would not affect future operability. Inspection and test results data will be reviewed by an independent consultant and a Westinghouse representative. Any identified deficiencies will be resolved prior to plant startup.