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U-602755  
4F.190  
June 5, 1997

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  
Response to Circuit Breaker Questions

PRIORITY ROUTING

First		Second	
RA		RC	
DRA		EIC	
DRP		SGA	
DRS	has	QI	
DNMS		PAO	
DRMA			

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FILE has

Dear Mr. Beach:

On May 21, 1997, Illinois Power personnel discussed with members of your staff plans to assess the adequacy of various voltage circuit breakers at CPS to perform their function. Subsequent to that meeting a list of questions from members of your staff were proposed to Illinois Power relating to this issue. The question and a response to the question that was asked is provided in an attachment to this letter.

If you would like to discuss this matter with me further please contact me at (217) 935-8881 extension 3178.

Sincerely yours,

Richard F. Phares  
Assistant to the  
Vice President

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MRS/kk

cc: James L. Caldwell, USNRC, Region III  
Geoffrey C. Wright, USNRC, Region III  
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NRC Senior Resident  
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### Answers to Circuit Breaker Questions

1. Critical non-safety related circuit breakers - What is their impact on safety system operability? Are they important to safety or to operation?

Response: Critical non-safety related circuit breakers is a term used by the CPS Breaker Team for circuit breakers that Illinois Power has deemed important to operating the plant. These circuit breakers are not required for the operation of safety related equipment or do they affect the safe operation of the plant.

2. No 4160 volt Westinghouse or GE circuit breakers are being refurbished prior to startup. How does this affect our position on reasonable assurance?

Response: One safety related GE circuit breaker was replaced with a fully refurbished circuit breaker and one GE circuit breaker had its operating mechanism refurbished during this refueling outage. One safety related Westinghouse circuit breaker was refurbished in 1995. Prior to startup all five safety related GE circuit breakers are undergoing a comprehensive inspection and testing plan based on industry and vendor information. All inservice safety related Westinghouse circuit breakers, excluding one previously refurbished and one cannibalized spare, will be subjected to a range of testing and inspections that was also developed from industry and vendor information. The testing and inspections as well refurbishment, as applicable, will contribute to determining the answer to reasonable assurance of circuit breaker material condition.

3. During the Engineering and Technical Support Inspection, Inspection Report 97003, information was revealed regarding undocumented circuit breaker failures.
  - a) Is it accurate that there were undocumented breaker failures?
  - b) Has this issue been addressed? This would include Maintenance involvement in failures to close.
  - c) Can CPS create a good equipment history to show a reliability factor? If possible, please provide the equipment history that was created.

Response:

- a) Yes.
- b) Yes. Operations has incorporated the requirements to document on a Condition Report any failures of a circuit breaker to perform on its first attempt, and to obtain engineering and maintenance involvement prior to attempting to operate the circuit breaker a second time unless it is an emergency situation into a training seminar. This seminar is currently being presented to plant operators in a self study format and is expected to be complete prior to startup.
- c) No. CPS cannot recreate equipment history based on undocumented failures.

- 4 What is the basis for the 100 msec timing criteria for circuit breaker closure and trip testing?

Response: The 100 msec criteria was chosen as a value based on nominal voltage timing as extrapolated to minimum voltage testing. Westinghouse specifies time ranges for mechanical closing and opening performed at nominal (nameplate) control voltage (125 VDC for CPS). However, they do not provide time value specifications at lower voltages. 100 msec is approximately 85% of the upper close time limit for 4.16 KV breakers and approximately 67% of the upper time limit for 6.9 KV breakers if tested at 125 VDC. 100 msec is also approximately double the upper open time limit if tested at 125 VDC.

CPS records response time values during minimum voltage tests (90 VDC Close, 70 VDC open). The lower the voltage used, the longer the response time should be. Thus, testing mechanical closing at 90 VDC (72% of 125 VDC) or mechanical opening at 70 VDC (56% of 125 VDC) will result in longer times than if performed at nominal voltage (125 VDC). The 100 msec is within the nominal voltage band, thus is conservative for low voltage closing testing. The 100 msec is a postulated value for low voltage opening timing, based on the value of voltage (70 VDC) used ( i.e. - while testing at approximately one half the nominal voltage it is reasonable to expect close to double the nominal time value). The 100 msec value is also a trigger point for CPS maintenance to contact Engineering for analysis. All time values are recorded and trended.

CPS GE 4.16 KV breakers have similar design specifications to that of Westinghouse, thus the 100 msec criteria that is reasonable to Westinghouse circuit breakers can be applied to the GE circuit breakers as well

From testing performed on Westinghouse circuit breakers so far, typical 90 VDC closing times have been in the 75-90 msec range and 70 VDC opening times have been in the 50-63 msec range.

Also, it is postulated that if the mechanism was degraded to the point that functionality was in question, either the timing values would be orders of magnitude larger than the 100 msec or the breaker mechanism would not close or open. This was substantiated by testing.

5. For 480V ABB circuit breakers- What post-refurbishment testing is being performed?

Response: All post-refurbishment testing at ABB is performed in accordance with their proprietary Quality Assurance Procedures (QAP) and CPS's Refurbishment Specification. Upon arrival at CPS and prior to plant installation all 480V ABB

circuit breakers are required to pass CPS receipt inspection/ testing. Specifically, CPS checks 24 attributes of the breaker to primarily verify that the vendor performed refurbishment as required and that shipping damage did not occur. The 24 items include performing trip device testing, ductoring, meggering, wiring configuration checks, tripper bar movement and general inspections such as wiring integrity, escutcheon plate gasket installation, arc chutes, contacts, hardware, etc..

6. In 480V ABB circuit breakers (Perry Issue) wiring problems were discovered on returned refurbished circuit breakers (current transformers?). Would post refurbishment testing that CPS performs on circuit breakers have identified this problem?

Response: Post-refurbishment testing performed at CFS would probably not identify this problem but the 10 CFR Part 21 program would have alerted CPS to this condition. ABB issued a 10 CFR Part 21 notification on this issue on 4/24/97 (received by CPS on 5/19/97). CPS is currently evaluating this information in accordance with our 10 CFR Part 21 notification. The refurbishment vendor for CPS's 480V ABB breakers (ABB, Houston, TX) is currently inspecting/testing the CPS breakers in accordance with ABB procedures that include tests to detect this problem.

7. Some ABB refurbishments had a trip device change out. Did this change out of trip devices occur at CPS. What actions have been taken regarding this issue? Post Mod Testing?

Response: CPS believes the background for this question is the industry issue concerning the change-out of older oil-dashpot (OD) trip devices with solid state trip devices during ABB refurbishments. Original units supplied to CPS were all of the solid state type and therefore, a replacement of the oil-dashpot trip device to the new solid state type was not necessary. For all present and future work, trip devices that are found to not meet acceptance criteria in accordance with ABB literature are either replaced or refurbished.

8. For the remaining safety related 480V circuit breakers that have not been refurbished. What is the schedule for refurbishment? On-line or not?

Response: There are 13 safety related ABB 480 volt circuit breakers at CPS that have yet to be refurbished. All 13 will either be tested or replaced with refurbished circuit breakers prior to startup. Those that are not refurbished prior to startup will be refurbished prior to the end of the next refueling outage. This is an increase of the number of circuit breakers that were previously planned to be tested or refurbished during this outage. This increase in scope is based on the results of test data for the ABB 480 volt circuit breakers. Some of these breakers will be

replaced with refurbished circuit breakers when the plant is on-line, others will require a bus outage with the plant off-line.

9. What is the schedule for the remaining GE 4160V circuit breakers?

Response: CPS has five GE 4160V circuit breakers. Three of the circuit breakers have passed a comprehensive inspection and test procedure. Two of the circuit breakers did not meet the criteria. One of the circuit breakers that did not pass the inspection and test procedure was replaced with a fully refurbished circuit breaker and the other that did not pass was replaced with a circuit breaker that had its operating mechanism refurbished. Current plans are that all five installed GE circuit breakers will have been fully refurbished within six months of startup.

10. GE inspection items 9-12 - What is the basis for the acceptance criteria of <1 ohm switch contact resistance?

Response: The <1ohm contact resistance check for the switches is based on ensuring that the voltage drop across the switch under the full range of voltages will not impact the voltage that is applied to circuit breaker components such as the close coil or charging motor, or auxiliary control circuitry, thus allowing proper operation of the circuit breaker.

11. Item 46 discusses high voltage testing at 1000 volts. We (NRC) are used to seeing this testing performed at 2500 volts. What is the rationale for 1000 volts?

Response: CPS standard practice is to megger at 500VDC or 1000VDC as governed by the circuitry or test equipment limitations. 1000 volt meggers provide adequate assurance in identifying low resistance conditions that would indicate insulation degradation. Any low readings are investigated. Note that megger results are trended.

12. Item 47 - with respect to the performance of a ductor test. What is the amperage of the ductor being used?

Response: A 10 amp ductor is used for this test.

13. Hi Pot test - Why did we not do one?

Response: High potential (Hi-Pot) testing is considered a potentially destructive test and is neither a CPS standard practice, nor a vendor recommended routine test. Currently only the Westinghouse DVP vacuum bottles are Hi-Pot tested as specified by the vendors instructions. This test is conducted in this specific application to ensure vacuum integrity.



14. Westinghouse 4160V - Illinois Power is purchasing 11 from GPU. Are they being bought safety or commercial and then dedicated?

Response: Illinois Power is purchasing eleven additional Westinghouse 4160 volt circuit breakers. The decision as to whether they will be purchased safety related or purchased commercial and then dedicated has not been made.

15. Schedule for replacement of 11 safety-related Westinghouse.

Response: One Division of Westinghouse DHP circuit breakers will be replaced with new or refurbished circuit breakers prior to the end of the next refueling outage. Breakers removed will be refurbished and used to replace other divisional circuit breakers until all divisional circuit breakers are refurbished. This will be complete prior to the end of the following refueling outage.

16. There is a significant difference between the Westinghouse and the GE checklists. Why the big difference between the two types of circuit breakers? Why aren't we doing more on Westinghouse circuit breakers?

Response: GE breakers have a poor industry reputation with over 100 known industry documents that describe concerns of the breakers. Westinghouse breakers have only a few. CPS has little equipment experience and history on GE breakers. The CPS experience with Westinghouse breakers is substantial due to the population and total number of preventive maintenance tasks that have been performed. Thus, the Westinghouse and the GE checklists are commensurate with vast differences in available data for each circuit breaker type, and therefore, will provide essential data for the assessment of issues and concerns specific to each breaker manufacturer.

17. 1a and 2a (Westinghouse 4160V) - Are they being done at 70V or 90V, respectively? It is clear for 1b and 2b. It is not clear for steps 1a and 2a.

Response: CPS Inspection Plan Item 1a (Closing at minimum voltage, 90 VDC) and 1b (Record time during closing at minimum voltage) are performed simultaneously. Likewise, CPS Inspection Plan Item 2a (Opening at minimum voltage, 70 VDC) and 2b (Record time during opening at minimum voltage) are also performed simultaneously.

18. Page 4, Items 6 and 7 - Criteria for inspecting others in failure.  
7. failure of any  
6. failure of 8  
Does this mean all or any?  
(Need clarification on what is meant)

Response: The original plan was to test a sample of 8 circuit breakers. The number of breakers that will be tested has been expanded to include all Westinghouse safety related circuit breakers. Since all safety related circuit breakers will be tested, Items 6 and 7 of the General Inspection Criteria no longer apply.

19. Item 6 - same as the 1 ohm resistance check. What is the justification?

Response: The  $<1\Omega$  contact resistance check for the motor cut-off switch is based on ensuring that the voltage dropped across the switch under the full range of voltages will not impact the voltage that is applied to the close coil or charging motor, thus allowing proper operation of the circuit breaker. For example, if the bus voltage was 95V which is lower than the postulated minimum battery voltage at the bus, the resistance of the switch could be as high as  $1.9\Omega$  (i.e. 5 volt drop) with a  $34\Omega$  (coil resistance value from Westinghouse) close coil to ensure that 90V (minimum nameplate voltage) was present at the coil. If bus voltage is higher, the allowable switch resistance also increases ( $13.2\Omega$  allowable at nominal 125Vdc bus voltage). This assures that adequate voltage is present at the coil if switch resistance is  $<1\Omega$ . Therefore, the  $<1\Omega$  criteria is conservative. Other utilities contacted also use the  $1\Omega$  criteria.

20. What does item 12 in the General Inspection Criteria mean? Does it require CPS to inspect "all" safety-related circuit breakers?

Response: Yes. If during inspections on Westinghouse breakers, Inspection Item 5 (Slow Close Checks) fail then all safety related Westinghouse breakers are required to be tested / inspected per Inspection Item 1a, 1b, 2a, 2b, (Low voltage tests) and Item 5 (Slow Close Checks).

21. Specific to Westinghouse circuit breakers; are megger and ductor testing being conducted? If this is not being performed, why is it not being performed?

Response: CPS has little equipment experience and history on GE breakers. However, the CPS experience with Westinghouse breakers is substantial due to the population and total number of preventive maintenance tasks that have been performed.

Megger and Ductor testing is a normal part of the CPS preventive maintenance tasks for both breakers. Due to the CPS experience on Westinghouse circuit breakers it was not deemed necessary to be included in the Westinghouse inspection plan. Conversely, it was considered necessary to assess GE circuit breaker performance using megger and ductor testing since CPS has little experience and history on GE circuit breakers.

22. Westinghouse 6.9 kV - What inspection and testing is done after rework of these breakers. (DVP?)

Response: After refurbishment and subsequent replacement of the contact roller assemblies for the vacuum bottles on the CPS DVP breakers several inspections and tests were performed. These tests included checking contact wear gap, vacuum integrity, contact resistance and, mechanical timing tests. As a conservative measure several of the DHP circuit breaker inspection plan items were applied to the DVP circuit breakers to provide additional assurance of satisfactory material condition.