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November 29, 1989

Mr. Thierry Ross
Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Molded-Case Circuit Breaker Replacement for Quad Cities Unit 1, NRC Docket No. 50-254

References: (a) NRC Bulletin 88-10, Nonconforming Molded-Case Circuit Breakers, dated November 22, 1988.

(b) M. Richter (CECo) letter to T. Ross (NRC), dated November 20, 1989.

Mr. T. Ross:

Prior to the startup of Quad Cities Unit 1 from its Fall 1989 refueling outage, it became necessary to use a molded-case circuit breaker (MCCB) from stock which was restricted from use by Action 7 of NRC Bulletin 88-10 (the Bulletin). This was the fourth breaker utilized during the outage which did not meet the requirements of Bulletin Action 7 (the previous breakers were reported in Reference (b)). As indicated in discussions with the NRC on this matter on November 22, 1989, this breaker had been tested in accordance with the Bulletin (as well as additional station testing). During these discussions, the NRC requested Commonwealth Edison (Edison) to submit a report on this breaker following unit startup. The Attachment to this letter provides an evaluation for the use of the breaker.

With this letter, Edison is requesting concurrence to deviate from Action 7 of the Bulletin for the breaker discussed in the Attachment. The breaker supplies power to Main Steam Line (MSL) Drain Outboard Isolation Valve 1-220-2.

It is expected that a traceable replacement breaker (which satisfies Action 7 of the Bulletin) for the MSL Drain Valve application will be obtained by the end of January, 1990. Following receipt and testing of this breaker, it will be installed at the first available opportunity which will not jeopardize or impact the operation of the unit (not to exceed the next refueling outage).

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It is Edison's understanding, per a teleconference with the NRC on November 22, 1989, that preliminary approval has been granted on this matter. Pending a more detailed review, the NRC will provide a formal response.

Please direct any questions on this matter to this office.

Respectfully,

Milton H. Richter

M.H. Richter
Generic Issues Administrator

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Attachment: Molded-Case Circuit Breaker Replacement for MSL Drain Valve 1-220-2.

cc: A.B. Davis-Regional Administrator, Region III
Resident Inspector-Quad Cities Station

ATTACHMENT

QUAD CITIES UNIT 1

MOLDED-CASE CIRCUIT BREAKER REPLACEMENT

Breaker Location:	250V DC Reactor Building MCC Rx #1B, Compt. M1
Equipment Fed:	Main Steam Line Drain Outboard Isolation Valve MO-1-220-2
Breaker:	Westinghouse Cat. No. FA3035M, 5 Amp, Adjustable Magnetic - only, Molded-Case Circuit Breaker

During the current Quad Cities Unit 1 refueling outage, a molded-case circuit breaker (MCCB) in the above location failed during manual cycling. The only available replacement breaker in the Commonwealth Edison Company (CECo) system existed at Quad Cities Station, however, that breaker was restricted from use by Action 7 of Bulletin 88-10 (the Bulletin). A new breaker, which meets the requirements of the Bulletin, is being pursued but cannot be obtained in time to avoid an operational impact on the unit. The available replacement breaker at Quad Cities Station has, with one exception, successfully passed the testing delineated in the Bulletin, as well as additional CECo testing. Based on the results of the testing performed, the replacement breaker has demonstrated that it can be expected to support safe plant operation.

The following paragraphs address the Breaker Failure, System Design Considerations, Replacement Breakers, Breaker Testing, Operability Evaluation and Follow-up Actions.

BREAKER FAILURE

The installed breaker failed mechanically on November 21, 1989, when the plastic operating handle broke during manual cycling of the breaker to perform an operational test on motor operated valve 1-220-2 (MO-1-220-2). The failure no longer allowed the breaker to be operated in the normal, safe manner using the through-the-door operating mechanism of the Motor Control Center (MCC) compartment. This breaker normally remains closed during all plant modes and is only opened when taking the valve out-of-service.

SYSTEM DESIGN CONSIDERATIONS

The breaker supplies power to the control circuit and motor of MO-1-220-2, Main Steam Line Drain Outboard Isolation Valve. This valve is normally closed but is required to be opened to provide the following.

- A flow path to drain main steam lines during startup and shutdown of the unit.

- A flow path to allow pressure equalization across Main Steam Isolation Valves (MSIVs) if the reactor is at pressure with the MSIVs shut.

The valve, which is a safety-related primary containment isolation valve, is normally cycled once a quarter during valve operability surveillance testing.

The breaker supplies power to MO-1-220-2 from a Class 1E 250V DC MCC. To accomplish its safety function, the breaker must be able to: 1) allow this valve to open/close reliably without tripping, and 2) trip to clear a downstream short circuit fault to prevent the upstream feed to the MCC from tripping (and to mitigate the effects of the fault). As such, the breaker's interrupting rating is designed to exceed the available short circuit current, and the breaker is adjusted and tested to trip instantaneously on currents above the maximum starting current of the valve motor, but below the trip setting of the MCC feed.

REPLACEMENT BREAKERS

For the circuit breaker that failed, there were no spare breakers of the same model in stock at Quad Cities Station, or at any other CECo facility, which were traceable to the circuit breaker manufacturer in accordance with the requirements of Action 7 of the Bulletin. A review of unassigned MCC compartments at Quad Cities Station also revealed that no spare breakers of the same model were available.

The failed circuit breaker is an obsolete model (FA type) for which direct (like-for-like) replacements are available only as refurbished from Westinghouse. Replacement breakers of a later model (FB type) can also be obtained but require a different mounting plate which is not yet seismically qualified for installation at Quad Cities Station. Either of these options require a long lead time (approximately 6 to 12 weeks), and neither is the preferred option by CECo. CECo has been pursuing a permanent replacement program for the obsolete Westinghouse breakers (FA and EH models) at Quad Cities Station. An engineering evaluation has recommended the use of Westinghouse Series C, type HFD breakers (which is a new series line) for the replacement program. These breakers are seismically qualified, however, seismic mounting issues are presently being evaluated. It is expected that a Westinghouse HFD breaker for MO-1-220-2 can be obtained by the end of January, 1990. CECo prefers utilizing the Westinghouse HFD breaker for consistency purposes with the permanent replacement program.

Quad Cities Station had one Westinghouse FA3035M replacement breaker, however, this breaker was procured from Westinghouse Electric Supply Company through HLC Electric Supply Company and was not traceable to the circuit breaker manufacturer. In response to NRC Information Notice 88-46 (and Bulletin 88-10), this breaker was made unavailable for replacement purposes. Since this was the only direct replacement breaker readily available, Quad Cities Station tested the breaker to assess whether it could be expected to perform reliably.

BREAKER TESTING

The replacement breaker at Quad Cities Station was tested in accordance with the applicable tests (shown below) of Attachment 1 to the Bulletin.

- mechanical test,
- millivolt drop test,
- rated current hold-in test
- overload test,
- adjustable instantaneous trip test (for the maximum and minimum settings), and
- dielectric test.

The breaker passed all of the applicable tests with the exception of the adjustable instantaneous trip test (at the maximum trip setting). When set at the maximum trip setting, the breaker's center pole tripped prematurely on application of 80 percent of the trip current (28 amps). The other two poles performed as designed during the instantaneous trip testing. Therefore, the failure of this test only demonstrates that the breaker would be unsuitable for use if the installed application of the breaker required the center pole to be utilized.

Subsequent to the Bulletin testing, Quad Cities Station performed additional testing on the replacement breaker in accordance with station procedure QEPM 200-4 (MCCB Inspection and Test). This procedure is performed on a MCCB prior to installation in a safety-related application and includes the test and adjustment of the instantaneous trip element to its installed setting. The testing of the instantaneous trip element is based on the following two premises:

- The largest load the MCCB should be expected to carry without tripping is the motor starting current plus an adequate margin for reliable operation. The procedure defines 9 times the motor nameplate full load current as the value at which the MCCB should not trip, and 15 times the motor nameplate current as the value at which the MCCB should trip

- The instantaneous trip element of a MCCB is not manufactured as a high precision device, as supported by the tolerances (+20% and +25%) allowed by the manufacturer (and the Bulletin test requirements) at the maximum and minimum trip settings. This has led Quad Cities Station to require a more precise method of setting the trip element to its particular installed application.

The station procedure adjusts the MCCB to a specific trip condition point to ensure that the best match exists between providing reliable service to the equipment supplied while still providing maximum protection from downstream short circuit faults. The procedure (which determines the instantaneous trip current by multiplying the rated equipment current by 12) was performed in the following manner to adjust the instantaneous trip setting for the replacement breaker.

- With the breaker's instantaneous trip adjustment dial at the maximum setting, a test current (39 amps), which is 15 times the motor nameplate full load current, was momentarily applied to the MCCB. If the MCCB did not trip, the trip setting was decreased by one increment and the test repeated using the same test current. This "test/trip adjustment" sequence was repeated until each pole tripped upon application of the test current.

- Utilizing the instantaneous trip setting at which each pole tripped, the test current was decreased to a value which is 9 times the motor nameplate full load current (23.4 amps), and each pole was verified to remain closed upon application of the test current.

Thus, this breaker testing not only verified the proper operation of the trip device, but also optimized its setting to the particular application. For this particular application, the breaker's center pole (which failed the Bulletin testing) is not used since this is a DC application and only two of the three poles are utilized.

OPERABILITY EVALUATION

As presented previously, the breaker for MO-1-220-2 provides a dual safety function in that it must be able to: 1) allow the valve to open/close reliably without tripping, and 2) trip to clear a downstream short circuit fault to prevent the upstream feed to the MCC from tripping.

The following testing demonstrated that the replacement breaker would be able to provide reliable power to the valve's circuit.

- The breaker remained closed under 100 percent rated current for at least one hour with no observable detrimental effects.

- The breaker remained closed at a surge current which was 9 times greater than the motor nameplate full load current.

- The low and consistent voltage drop readings of the poles at full current (approximately 427 millivolts at 5 amps) indicate that the breaker contacts are in good condition, and can supply full voltage to all three phases of the motor with minimal losses.

In addition, MO-1-220-2 is cycled to demonstrate its operability subsequent to the breaker replacement, and during quarterly surveillance testing, providing additional assurance that the replacement breaker can provide the required electrical power to the valve.

Regarding the second safety function of the breaker, the testing demonstrated that the breaker will trip on fault currents which are a suitable margin above the anticipated normal surge currents associated with motor starting and valve seating/unseating. Additionally, there is assurance that the breaker will successfully clear a fault by the high dielectric resistance readings (10,000 Megohms or greater) between line and load sides at 2500 volts DC. The high dielectric strength measured between poles (5,000 Megohms or greater) also demonstrated insulation integrity and provides assurance that the replacement breaker itself will not create a fault on the MCC.

The results of the testing on the replacement breaker demonstrate that the breaker can be expected to perform its dual safety function. Additionally, the valve testing routinely performed (by the quarterly surveillance) provides further assurance that the breaker will supply reliable power to the valve for operation.

FOLLOW-UP ACTIONS

A new breaker (Westinghouse type HFD), traceable to the circuit breaker manufacturer, is being pursued at this time for MO-1-220-2. As indicated previously, seismic mounting issues are presently being evaluated. Following receipt (expected by the end of January 1990) and testing of this traceable breaker, it will be installed at the first available opportunity which will not jeopardize or impact the operation of the unit (not to exceed the next refueling outage).

CONCLUSION

Although the replacement breaker does not meet the requirements of Action 7 of Bulletin 88-10 (and in fact has been traced to HLC Electric Supply Company), the breaker has demonstrated through physical testing that it can be expected to perform its intended safety function (and support safe plant operation) until a new, traceable breaker becomes available for use.

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