CP&L

Carolina Power & Light Company

Brunswick Nuclear Plant
P. O. Box 10429
Southport, NC 28461-0429
March 26, 1993

FILE: B09-13520 10CFR21
SERIAL: BSEP-93-0041

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT UNITS 1 AND 2
DOCKET NO. 50-325 AND 50-324
LICENSE NO. DPR-71 AND DPR-62
NOTIFICATION OF A 10CFR21 REPORTABLE OCCURRENCE

This notification is being sent to support the initial notification made February 25, 1993, of a 10CFR21 reportable occurrence discovered December 30, 1992. Attached is an evaluation of possible manufacturing defects associated with Westinghouse Type HMCP and Type HFD breakers purchased under Westinghouse's Appendix B program. These manufacturing problems result in the potential for breaker contacts not opening during trip conditions and could compromise the ability of the electrical distribution system to isolate component faults. A failure of a single 480 volt motor control center circuit breaker to open under a fault could result in the loss of the motor control center and its safety related loads. Contact Robert Godley, Manager Regulatory Programs at 1-919-457-2412 if additional information is required.

Very truly yours,

J. M. Crawford

C. C. Warren, Plant Manager Unit 2

cc: Mr. S. D. Ebneter
Mr. P. D. Milano
BSEP NRC Resident Office



IE19
1/1

ATTACHMENT 1

Westinghouse Type HMCP Breaker Trip Coil Plungers

In December of 1992, instantaneous trip testing per preventive maintenance (PM) procedure OPM-BKR008 identified four breaker failures. The Westinghouse HMCP150 breakers did not completely open when subjected to instantaneous currents in excess of NEMA AB4-1991 "Tolerances of Marked Adjustable Trip Circuit Breakers." While the breakers in question powered the reactor building supply or exhaust fans, other plant uses include safety related systems (a total of 141 breakers).

Evaluation of these breaker failures revealed a defect in the fabrication of the magnetic trip coil plungers that trip the circuit breaker open. As current increases, the magnetic field increases until the plungers hit their stops and pull down the trip bar. This rotates the trip cam and trips the breaker. The plungers utilize springs to hold the plunger against the magnetic field of the current sensing coils. The springs are held on the plungers with a metal disc cap which appears to be susceptible to fracturing due to the composition/fabrication of the cap. Breakers manufactured between October 1986 and October 1987 contain plungers with metal caps that are cast of a 90% zinc/10% aluminum composite which resulted in voids in the center of the discs. This weakens the cap causing it to fracture and once the cap has fractured, the springs can become lodged in bearing areas causing breaker malfunctioning, wear and friction.

Westinghouse has indicated that the original design of the plungers utilized a steel cap but this was later changed to a zinc composite. Performance problems identified to Westinghouse by the commercial industry resulted in changing the design back to the original steel plunger cap. Breakers manufactured between October 1986 and October 1987 are susceptible to this manufacturing defect. Westinghouse indicated that the date code (manufactured date) was specified on the back of the breakers. The date coding used was 861001 or 61001 for October 1, 1986, through 871030 for October 30, 1987. A plant walkdown revealed all 74 HMCP breakers on Unit 2 were manufactured within this date code range, along with 67 of the Unit 1 breakers.

During evaluation of the potential impact, four HMCP breakers with the affected code dates were removed from stock and trip tested (overcurrent trip testing). The first breaker failed after the fourth test ('C' phase plunger cap broke). The second breaker failed after the first test ('C' phase plunger cap broke). The third breaker failed on the fifth test ('A' phase plunger cap broke). The fourth breaker failed on the eighteenth test ('C' phase plunger cap broke).

To verify the date code range provided by Westinghouse, an HMCP breaker manufactured in 1988 was checked for defective plungers. The plungers were of a steel composition.

As a result of the spare stock testing, HMCP breakers on Units 1 and 2 with potentially defective trip plungers are being replaced prior to Startup of the applicable Unit.

In addition to the defect in the fabrication of the plunger assembly, the failure evaluation indicates inadequate lubrication and manufacturing tolerances in the trip mechanism.

Common Westinghouse Type HFD and HMCP Breaker Issues

Both the HFD and HMCP breakers are Westinghouse Series C Molded Case Breakers, F-Frame and have the same trip/close mechanism for operation of the contacts. The Westinghouse Type HFD breaker failures can also be grouped into two categories which impact HMCP breakers:

(1) Inadequate fabrication and tolerances

(2) Inadequate lubrication at critical hinges

On December 20, 1992, the HFD3070 breaker for the Diesel Jacket Water Heater tripped and could not be reset. The breaker was found to be defective and replaced (WR/JO 92-BIJB1). On December 26, 1992, the installed circuit breaker experienced an overcurrent condition generated by a cable insulation breakdown at the conduit entrance. The replacement breaker failed to open completely, but opened sufficiently to de-energize the control power feeding the breaker compartment contactor. A total of 79 Type HFD breakers, including safety related system applications exist at Brunswick.

The failures occurred due to inadequate lubrication and manufacturing tolerances of the trip mechanism. Lack of lubrication in critical friction areas may prevent the circuit breaker from fully opening. Lubrication and proper tolerences are critical to avoid partial-opening of the circuit breaker. A null point exists in the trip mechanism actuation when the spring force becomes zero requiring inertia to carry the mechanism to the fully tripped position. Excessive friction may prevent the breaker from fully opening.

Hinge bearing misalignment, cam plate misalignment, and the lack of lubrication in critical areas may contribute to the failures. The failure mechanism involves inadequate tolerances in critical bearing areas and inadequate lubrication in the assembly.

Evaluation for Corrective Actions to be taken due to the common HFD/HMCP Issues.

With the exception of the material change in the HMCP plunger, the manufacture and/or design of the HMCP and HFD breakers utilized as replacements are identical to the original breakers. To establish operating criteria for the use of HFD/HMCP breakers, in regards to the lubrication/manufacturing tolerance issue, 38 breakers in stock (HFDs and HMCPs) were tested with date codes from 1986 to 1992. The breakers were each manually tripped 20 times and observation of the breaker handle showed no hesitation that would indicate a lubrication problem. Additionally, manual trip testing of 16 HMCP breakers that had been removed due to the plunger issue was performed on March 5, 1993. Six of the 16 breakers exhibited hesitation during the trip testing. This 35% failure rate indicated the failure may be associated with service time.

Using the "Push-to-Trip" test button to trip the breaker while observing the breaker handle during the trip operation, provides a method to test breakers for insufficient lubrication and/or manufacturing tolerances. Internal examination found that the position of the breaker moveable contacts closely follows the movement of the breaker handle during a trip. Although a trip free device, when the handle failed to move, the contacts remained virtually in the closed position. If the handle hesitates, the hesitation is indicated in the movement of the moveable contacts. If hesitation or sticking is observed in movement of the breaker handle, it is a reflection of the movement of the breaker contacts.

As the breaker failures indicate a relationship may exist relative to service time, the HFD and HMCP breakers are being replaced prior to the Unit Startup.

Westinghouse continues to work with CP&L engineering to resolve this issue. In the interim, existing preventive maintenance (PM) procedures and schedules were reviewed as part of Engineering Evaluation Report (EER) 93-0272 and the following procedural changes are being pursued:

Procedure 0PM-BKR006, PM on "GE 480 VAC Motor Control Center Compartments with Westinghouse Components", is being revised (Due 4/30/93) to require instructions for manual trip testing, as described above. Instructions are also being added to observe movement of the trip handle during the manual trip testing and to inform engineering of failures encountered during testing. This PM is scheduled for yearly performance, and should provide trending information for further evaluation of the lubrication problem associated with these breakers.

Procedures OPM-BKR008 and 0PM-BKR008A, PM - "Functional Testing of Molded Case Circuit Breakers", were revised to add

instructions for observance of the trip handle during breaker testing. The procedure now requires breaker replacement if hesitation during testing is observed. The instructions also require the breaker be evaluated by engineering personnel. These procedures are to be performed on a six year frequency.