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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

July 31, 1986

IE INFORMATION NOTICE NO. 86-62: POTENTIAL PROBLEMS IN WESTINGHOUSE MOLDED CASE CIRCUIT BREAKERS EQUIPPED WITH A SHUNT TRIP

Addressees:

All nuclear power reactor facilities holding an operating license or a construction permit.

Purpose:

This notice is to alert recipients to a potentially significant problem involving the failure of shunt trip coils in Westinghouse molded case circuit breakers (breakers) type LBB 22250 MW. Breaker types LB 22250, HLB 22250, and DA 22250 have similar operating mechanisms which can affect the operation of the shunt trip coils. However, to date no failures of the shunt trip coil have been reported for these breakers. It is expected that recipients will review this information for applicability to their facilities and consider actions, if appropriate, to preclude a similar problem from occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore no specific action or written response is required.

Description of Circumstances:

On February 6, 1986, an open occurred or was discovered in the shunt trip coil (STC) circuitry which could have resulted in the failure of the associated breaker to trip open on an abnormal voltage condition at the Peach Bottom Reactor. The breaker is identified as an LBB 22250 MW type molded case circuit breaker manufactured by Westinghouse. The breaker is installed in a transfer panel to protect the 120-V 60 Hertz power supply to the reactor protection system (RPS) from undervoltage, overvoltage and underfrequency conditions.

In RPS applications, loss of the STC prevents the breakers from tripping automatically on abnormal voltage conditions. Tripping of this breaker on abnormal voltage conditions is essential because it interrupts a potentially damaging abnormal voltage supply to the RPS relays, scram solenoids, and other safety-related electronic devices. However, failures of the STC does not, by itself, prevent a reactor scram. Also, the breaker is equipped with a magnetic overcurrent trip device that protects the circuits in the event of a fault.

The STC in series with a contact is activated through a toggle linkage by the breaker's moving main contact arms. The failure of the STC occurred when the contact did not open when the breaker tripped resulting in the overheating of

the STC and ultimately in an open circuit in the shunt trip circuit. If the breaker had been subjected to an abnormal voltage condition after reset the open shunt trip circuit would have prevented breaker trip.

On January 16 and 24, 1986 the same types of problems were identified in similar breakers at the Peach Bottom Unit 3 plant. On November 9, 1984, Limerick 1 reported an identical failure. It is essential that the STC remain operable to assure the circuit breaker trips in the event of an abnormal voltage condition. Administrative measures have been established to periodically test and verify the operability of the STC at the Peach Bottom and Limerick nuclear power plants.

Discussion:

The failures described above have occurred in LBB 22250 MW type breakers with a STC. Westinghouse supplied the breakers to ASCO Electrical Products, Incorporated who installed them in safety-related RPS power supply monitoring panels required for boiling water reactors (BWRs). LB 22250, HLB 22250, and DA 22250 type breakers, which have similar operating mechanisms to LBB 22250, may have been supplied to other manufacturers for use in safety-related applications.

The performance of the breaker is affected only when used with a STC. The STC is energized by the closure of a normally open contact which is actuated through a toggle linkage by the breaker's moving main contact arms. Westinghouse stated that the moving contact arms may be impeded from being fully displaced to the "open" position by excessive material in the rivet which holds the handle post to the operating mechanism.

The 2-pole molded case circuit breaker is equipped with an A contact that is operated by toggle operating links controlled by the breaker operating handle. The A contact is an auxiliary switch which is open when the breaker is in the open or tripped position and is closed when the breaker is closed ("ON" position). This A contact is in series with the 125-V dc STC. When the breaker is closed, the auxiliary A contact is closed and the STC is ready to receive a signal to trip the breaker if any one of the RPS power monitoring relays senses an abnormal voltage condition. The STC is not rated for continuous duty and will overheat and be damaged if subjected to full voltage for more than a few seconds.

The STC can be made to fail, after the breaker has tripped by either of the following actions or conditions:

1. If the operating handle is pushed to the "ON" position without resetting the breaker, when a trip signal is present. This will not close the breaker, but will close the A contact, thus continuously energizing the STC.
2. If the previously described interference between the operating handle and the toggle operating links exist the act of resetting the breaker and, before clearing the trip signal, attempting to close the breaker. The toggle operating links may jam in the "ON" position, unless the operating handle is pushed toward the "OFF" or "RESET" position, again causing the STC to be continuously energized.


The breaker will trip even if the operating handle is forcibly kept in the "ON" position when a trip signal is received or present if the STC is operable. However, because the operating handle is in the "ON" position, the contact will not open to disconnect the power supply to the STC.

Westinghouse recommends the following tests to ascertain the operability of the breaker.

1. Perform a continuity check on the STC after each breaker operation via the two leads exiting the breaker.
2. Operability of the STC protection can be determined by completing the following tests:
 - a. Manually close the breaker and continue to hold the operating handle in the "ON" position.
 - b. Apply the shunt trip rated voltage through the two leads exiting the breaker until the breaker trips or one second elapses.
 - c. While continuing to hold the handle in the "ON" position, perform a continuity check of the shunt trip circuit. Continuity indicates a malfunction in the contact. An open circuit indicates that the contact has performed its intended function.

Westinghouse revised the circuit breaker mechanism assembly drawing to specify the removal of excessive rivet material and prevent recurrence of this problem.

No specific action or written response is required by this notice. If you have any questions regarding this notice, please contact the Regional Administrator of the appropriate NRC regional office or this office.


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Attachment: List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED
 IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
86-61	Failure Of Auxiliary Feed-water Manual Isolated Valve	7/28/86	All power reactor facilities holding a CP
86-60	Unanalyzed Post-LOCA Release Paths	7/28/86	All power reactor facilities holding an OL or CP
86-31 Sup. 1	Unauthorized Transfer And Loss Of Control Of Industrial Nuclear Gauges	7/14/86	All NRC general licensees that possess and use industrial nuclear gauges
86-59	Increased Monitoring Of Certain Patients With Implanted Coratomic, Inc. Model C-100 and C-101 Nuclear-Powered Cardiac Pacemakers	7/14/86	All NRC licensees authorized to use nuclear-powered cardiac pacemakers
86-58	Dropped Fuel Assembly	7/11/86	All power reactor facilities holding an OL or CP
86-57	Operating Problems With Solenoid Operated Valves At Nuclear Power Plants	7/11/86	All power reactor facilities holding an OL or CP
86-56	Reliability Of Main Steam Safety Valves	7/10/86	All PWR facilities holding an OL or CP
86-55	Delayed Access To Safety-Related Areas And Equipment During Plant Emergencies	7/10/86	All power reactor facilities holding an OL or CP
86-54	Criminal Prosecution Of A Former Radiation Safety Officer Who Willfully Directed An Unqualified Individual To Perform Radiography	6/27/86	All holders of NRC license authorizing the possession of byproduct, source, or special nuclear material

OL = Operating License
 CP = Construction Permit