

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

February 2, 1993

NRC INFORMATION NOTICE 93-09: FAILURE OF UNDERVOLTAGE TRIP ATTACHMENT ON
WESTINGHOUSE MODEL DB-50 REACTOR TRIP BREAKER

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the failure of an undervoltage trip attachment on a reactor trip breaker at the Salem Nuclear Generating Station, Unit 1. The failure occurred during surveillance testing. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On July 25, 1991, Public Service Electric and Gas Company, the licensee for Salem, Unit 1, was conducting the monthly surveillance tests of the undervoltage trip attachment and the shunt trip attachment associated with reactor trip circuit breakers. Licensee personnel successfully completed the shunt trip attachment surveillance tests. However, when the undervoltage trip attachment trip test was attempted on the "A" reactor trip breaker (Westinghouse model DB-50), the circuit breaker required approximately 16 cycles (0.267 seconds) to open. For the function to be considered operable, technical specifications require that the breaker open in 10 cycles (0.167 seconds) or less. A second attempt to open the breaker using the undervoltage attachment was unsuccessful; the breaker remained closed.

Discussion

On July 26, 1991, a Westinghouse representative and licensee personnel performed various bench tests on the "A" reactor trip breaker. The tests indicated that the breaker had been properly maintained and that the breaker trip bar was functioning normally. However, when the undervoltage trip attachment was tested, it again failed to open the breaker. The undervoltage trip attachment was not striking the circuit breaker trip bar with sufficient force to lift the bar. When the undervoltage trip attachment was lubricated and retested, the undervoltage trip attachment armature successfully lifted the circuit breaker trip bar, opening the breaker within the required 10 cycles. The licensee re-lubricated and tested the undervoltage trip

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attachment with 300 grams of weight added to the trip bar as required by the monthly surveillance test procedure. The test was again performed satisfactorily. The trip attachment also lifted the trip bar with an added 460 grams, the amount of additional weight required by the licensee semi-annual surveillance test procedure.

Initially, the cause of the failure appeared to have been inadequate lubrication; however, the undervoltage trip attachment was returned to Westinghouse for further evaluation. Westinghouse later concluded that the root cause of the failure of the device was abnormal frictional forces which resulted primarily from the unpolished outside latch contact surfaces of the undervoltage trip attachment. Westinghouse representatives stated that these areas had not been properly finished during the manufacturing process. The outside contact surface of the latch was "bright" on only one edge rather than on the entire surface. The "bright" edge also appeared to be burred or serrated.

Westinghouse representatives also found excessive wear and grooving on the undervoltage trip attachment latch spring at a location where the latch and latch spring were making contact. Contact between the latch and the latch spring occurred because the latch spring was somewhat deformed and did not lie flat as designed. The latch spring deformation, grooving, and wear in combination with the improperly finished latch contact surfaces created additional internal frictional forces such that the undervoltage trip attachment armature was unable to apply sufficient force to lift the breaker trip bar.

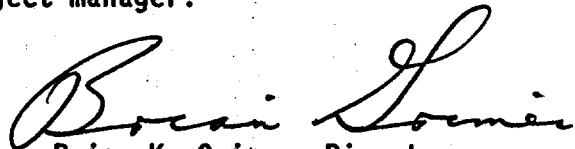
During the evaluation, Westinghouse personnel reassembled and cycled the undervoltage trip attachment 250 times. The undervoltage trip attachment was then tested, lubricated, and retested. Each time the undervoltage trip attachment was tested, it provided sufficient force to operate the breaker trip bar. However, the force applied by the device appeared to decrease at 250 cycles but increase at 500 cycles. The force then appeared to decrease somewhat after 750 cycles, although this may be attributed to testing inaccuracies. While the testing was not considered conclusive, the performance of the undervoltage trip attachment apparently degrades and then improves to some plateau. Westinghouse concluded that this change results from, first, increasing friction as the latch cuts into the latch spring; and later, decreasing friction as the parts wear and as pressure from the latch spring decreases as it permanently deforms.

The undervoltage trip attachments equipped with improperly finished latches were provided to various utilities by the Replacement Component Services (RCS) Department of the Westinghouse Nuclear Services Division (NSD). These undervoltage trip attachments were supplied either individually or as part of remanufactured or overhauled Westinghouse Model DB-50 circuit breakers with installed undervoltage trip attachments. Westinghouse determined that all the improperly finished undervoltage trip attachment parts were from one lot of parts that was made exclusively for RCS by a subcontractor. The same subcontractor made a second lot of undervoltage trip attachment parts; this second lot contained no improperly finished parts. Westinghouse

representatives stated that none of the defective parts have been used in undervoltage trip attachments or DB-50 circuit breakers available on the open market as commercial grade items. Westinghouse informed the NRC that it has notified all customers of record who have purchased undervoltage trip attachments or Model DB-50 circuit breakers with parts from the affected lot.

Westinghouse personnel recommended that the Salem licensee visually inspect, for proper finish, the undervoltage trip attachment latches on all other Model DB-50 circuit breakers at the Salem facility. They also recommended that the licensee develop criteria for replacing the undervoltage trip attachment when the difference in the force generated before and after lubrication exceeds a predetermined value.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contacts: N. Fields, NRR
(301) 504-1173

S. Alexander, NRR
(301) 504-2995

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-08	Failure of Residual Heat Removal Pump Bearings due to High Thrust Loading	02/01/93	All holders of OLs or CPs for nuclear power reactors.
93-07	Classification of Transportation Emergencies	02/01/93	All licensees required to have an emergency plan.
93-06	Potential Bypass Leakage Paths Around Filters Installed in Ventilation Systems	01/22/93	All holders of OLs or CPs for nuclear power reactors.
93-05	Locking of Radiography Exposure Devices	01/14/93	All Nuclear Regulatory Commission industrial radiography licensees.
93-04	Investigation and Reporting of Misadministrations by the Radiation Safety Officer	01/07/93	All U.S. Nuclear Regulatory Commission medical licensees.
93-03	Recent Revision to 10 CFR Part 20 and Change of Implementation Date to January 1, 1994	01/05/93	All byproduct, source, and special nuclear material licensees.
93-02	Malfunction of A Pressurizer Code Safety Valve	01/04/93	All holders of OLs or CPs for nuclear power reactors.
93-01	Accuracy of Motor-Operated Valve Diagnostic Equipment Manufactures by Liberty Technologies	01/04/93	All holders of OLs or CPs for nuclear power reactors.
92-86	Unexpected Restriction to Thermal Growth of Reactor Coolant Piping	12/24/92	All holders of OLs or CPs for nuclear power reactors.

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Orig /s/'d by BKGrimes
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OEAB:DORS NFields* 01/25/93	ADM:RPB JMain* 09/06/92	EELB:DE SAlexander* 10/22/92	ASC/OEAB:DORS EGoodwin * 01/13/93
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C/EELB:DE CBerlinger* 01/15/93	C/OEAB:DORS AChaffee* 01/19/93	C/OGCB:DORS GMarcus* 01/25/93	B/DORS BGrimes 01/26/93
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