

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

January 6, 1992

NRC INFORMATION NOTICE 92-03: REMOTE TRIP FUNCTION FAILURES IN GENERAL
ELECTRIC F-FRAME MOLDED-CASE CIRCUIT
BREAKERS

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 a potentially safety-significant problem resulting from the possible failure of the remote trip functions of General Electric (GE) F-frame (225-ampere frame size) molded-case circuit breakers (MCCBs). 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 November 5, 1991, GE Nuclear Energy (GE NE), San Jose, California, issued an interim notification of its evaluation of a deviation in accordance with the latest revision (effective October 29, 1991) of Part 21, "Reporting of Defects and Noncompliance," of Title 10 of the Code of Federal Regulations (10 CFR Part 21). The notification described the deviation as a "tolerance buildup" in certain GE F-frame MCCBs with undervoltage releases (UVRs) and shunt trip devices (STs) that may inhibit these internal accessory remote trip devices from functioning properly under conditions that produce sustained high internal temperatures in the MCCBs.

The attachment to the GE NE notification was taken from a draft Service Advice Letter (SAL) on this subject being prepared by the MCCB manufacturer, GE Electrical Distribution and Control (ED&C), in Plainville, Connecticut. GE NE plans to send the 10 CFR Part 21 interim notification to all of its customers who have purchased F-frame MCCBs for safety-related applications and to all GE NE Material Services field representatives. GE ED&C plans to send the SAL (issued November 25, 1991 as SAL 91-2F) to all of its customers of record, many of whom are distributors. However, both the F-frame MCCBs and their accessory trip devices are available on the open market as commercial grade items through various distribution paths. Therefore, the licensees for some nuclear plants who use these MCCBs may not receive the GE notifications.

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Discussion

Although still evaluating the problem, the MCCB manufacturer has determined that assembly and operational variations caused the reported failures. The variations reportedly resulted from (1) tolerances in mounting the accessory trip devices in the MCCBs, (2) tolerances on the adjustment of the ambient compensating bimetal (part of the thermal overload trip mechanism), and (3) sustained high operating temperatures in the MCCBs. The high internal temperature in the MCCB required to produce a condition conducive to the malfunction can result from continuous high current load (greater than 50 percent of the overcurrent trip unit rating for more than 2 hours) together with a high ambient temperature in the enclosure. A secondary heat source could also produce the high temperatures required for this malfunction.

GE NE stated in its interim notification that UVR- and ST-equipped MCCBs produced after April 1991 (date codes J116= and I116=) incorporated changes that would prevent this condition. GE NE also stated that an MCCB may or may not exhibit this malfunction, depending on the particular circumstances associated with the assembly of the breaker and the accessory remote trip devices, in conjunction with the high temperature service conditions believed to be conducive to failure. Nevertheless, GE NE maintained that affected MCCBs will trip under overcurrent conditions and will trip remotely at the lower MCCB internal temperatures usually present with lower load currents and enclosure ambient temperatures or without secondary heat sources.

GE NE initially reported that it had identified a specific safety-related application for the affected F-frame MCCBs equipped with internal accessory remote trip devices. The identified application is associated with the multiple electrical protection assemblies (EPAs) used in boiling water reactor (BWR) plants to monitor power quality to the reactor protection system (RPS). The EPAs trip the F-frame breakers for the RPS power supplies by means of the remote trip devices if the EPAs detect overvoltage, undervoltage, or underfrequency conditions in RPS power. In addition, GE NE informed the NRC in a subsequent communication that it may also have supplied some of the affected MCCBs as part of subassembly-level applications not separately identified in GE NE records. The affected MCCBs fitted with factory-installed remote trip accessories may also be used in numerous other applications in all types of nuclear plants in which remote tripping of an F-frame MCCB by means of the UVR or ST may be a safety-related function.

The presence of UVRs or STs in F-frame MCCBs should be apparent when the units are installed in the plant. However, even if accessory designation markings are not evident, affected MCCBs can be recognized by the two UVR or ST lead wires protruding through small openings in the sides of the MCCB case. Additionally, UVRs set up for monitoring 240, 480, or 600 volts-AC or 250 volts-DC should have an external dropping resistor connected in series with one of their lead wires. Attachment 1 lists the breaker frame type designations of

the potentially affected MCCBs and the catalog numbers of the affected internal accessory remote trip devices and also gives the date codes of the units believed by the manufacturer to be affected.

In view of the potentially wide scope of application of the affected MCCBs, addressees may find the affected types of UVR- and ST-equipped MCCBs both installed and in the warehouse. Addressees who find any affected MCCBs may consult the manufacturer on this subject to determine the appropriate corrective action, including testing for the existence of the malfunction, analyzing the potential high temperature producing conditions, or replacing the affected components.

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



Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical contact: S. D. Alexander, NRR
(301) 504-2995

Attachments:

1. Affected MCCBs and Accessories
2. List of Recently Issued NRC Information Notices

AFFECTED MCCBs and ACCESSORIES

The affected GE F-frame ("F-225 Line") MCCBs include the breaker types or frames listed below which can be fitted with any of the accessory remote trip devices with the listed catalog numbers:

BREAKER FRAMES

TFK, THFK
TFJ
THLC2
THLB2
THLC4
TLB4

SHUNT TRIPS

TFKSTA12
TFKSTA13
TFKSTA7
TFKSTA8
TFKSTA9
TFKSTA11

UNDervOLTAGE RELEASES

TFKUVA1
TFKUVA2
TFKUVA4
TFKUVA6
TFKUVA7
TFKUVA8
TFKUVA9
TFKUVA10
TFKUVA11

According to GE NE and GE ED&C, the tolerance buildup affects F-frame MCCBs and UVRs and STs assembled between August 1979 and April 1991 (accessory date codes N927* through N116=). The potentially affected MCCBs could have manufacturing date codes J927* through J116= (I116= for current limiting frames), but ED&C reported no identifiable volume of field returns for this condition among MCCBs built before the fourth quarter of 1987 (breaker date codes J736+ and I736+). The accessory date code is its manufacturing date code and only appears on the accessory itself. However, the date code from the accessory installation facility may appear on the MCCB case in addition to the manufacturing date code of the MCCB.

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-02	Relap5/Mod3 Computer Code Error Associated with the Conservation of Energy Equation	01/03/92	All holders of OLs or CPs for nuclear power reactors.
92-01	Cable Damage Caused by Inadequate Cable Installation Procedures and Controls	01/03/92	All holders of OLs or CPs for nuclear power reactors.
91-87	Hydrogen Embrittlement of Raychem Cryofit Couplings	12/27/91	All holders of OLs or CPs for nuclear power reactors.
91-86	New Reporting Requirements for Contamination Events at Medical Facilities (10 CFR 30.50)	12/27/91	All licensees authorized to use byproduct materials for human use.
91-85	Potential Failures of Thermostatic Control Valves for Diesel Generator Jacket Cooling Water	12/26/91	All holders of OLs or CPs for nuclear power reactors.
91-84	Problems with Criticality Alarm Components/Systems	12/26/91	All Nuclear Regulatory Commission (NRC) fuel cycle licensees, interim spent fuel storage licensees, and critical mass licensees.
91-83	Solenoid-Operated Valve Failures Resulted in Turbine Overspeed	12/20/91	All holders of OLs or CPs for nuclear power reactors.
91-18, Supp. 1	High-Energy Piping Failures Caused by Wall Thinning	12/18/91	All holders of OLs or CPs for nuclear power reactors.
91-82	Problems with Diaphragms in Safety-Related Tanks	12/18/91	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

the potentially affected MCCBs and the catalog numbers of the affected internal accessory remote trip devices and also gives the date codes of the units believed by the manufacturer to be affected.

In view of the potentially wider scope of the application of the affected MCCBs, addressees may find the affected types of UVR- and ST-equipped MCCBs both installed and in the warehouse. Addressees who find any affected MCCBs may consult the manufacturer on this subject to determine the appropriate corrective action, including testing to confirm the existence of the malfunction, analyzing the potential high temperature producing conditions, or replacing the affected components.

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Office of Nuclear Reactor Regulation

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Attachment 1: Affected MCCBs and Accessories
Attachment 2: List of Recently Issued NRC Information Notices

DISTRIBUTION:

Central Files	PDR	DRIS R/F	VIB R/F
SAlexander	CVanDenburgh	LNorrholm	BGrimes
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* see previous concurrences

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DATE	:12/19/91*	:12/4/91*	:12/19/91*	:12/4/91*	:12/19/91*	:
OFC	:BC:GCB:DOEA	:DD:DOEA	:	:	:	:
NAME	:CBerlinger	:CERossi	:	:	:	:
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Original Signed by
Charles E. Rossi

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NAME	:CBerlinger	:CERossi	:	:	:	:
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Office of Nuclear Reactor Regulation

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(301) 492-0995
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Attachment 1: Affected MCCBs and Accessories
Attachment 2: List of Recently Issued NRC Information Notices

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December XX, 1991
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Attachment 1: Frame Types and Date Codes of Affected MCCBs and Catalog Numbers and Date Codes of Affected Accessories

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DATE	12/ /91	12/ /91			