

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

May 19, 1994

NRC INFORMATION NOTICE 91-81, SUPPLEMENT 1: SWITCHYARD PROBLEMS THAT
CONTRIBUTE TO LOSS OF OFFSITE
POWER

Addressees

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

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this supplement to Information Notice (IN) 91-81, "Switchyard Problems That Contribute To Loss Of Offsite Power," dated December 16, 1991, to alert addressees to a possible zener diode failure that could cause false operation in stuck breaker failure unit (SBFU) relays and certain (SA-1) generator differential relays. The SBFU and differential relays in question were manufactured by Westinghouse Electric Corporation (Westinghouse). 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.

Background

The original information notice (IN 91-81) described an event on April 23, 1991, during which the Vermont Yankee Nuclear Power Station (Vermont Yankee) experienced a loss of offsite power when the 345-kV and 115-kV circuit breakers in the switchyard opened. An NRC augmented inspection team sent to investigate this event determined that zener diodes installed in the SBFU relays failed due to a voltage spike in the direct current control system, causing the 345-kV and 115-kV circuit breakers to open.

In a separate event on October 22, 1984, at Vermont Yankee, SA-1 relays used in a diesel generator protection circuit failed and caused the diesel generator breaker to trip and lock out. The failure of the SA-1 relays was attributed to the shorting of zener diodes.

Discussion

In both instances, Vermont Yankee, with the help of the vendor, installed a redesigned circuit, eliminating the zener diodes that were vulnerable to shorting. Similar vulnerable zener diodes could still be in use in the SBFU

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relays protecting switchyard circuit breakers and SA-1 relays in safety-related circuit breakers at other operating reactors. The failure of these zener diodes could result in failures that affect the availability of either the offsite or onsite power source that would be required during normal plant operation or under accident conditions.

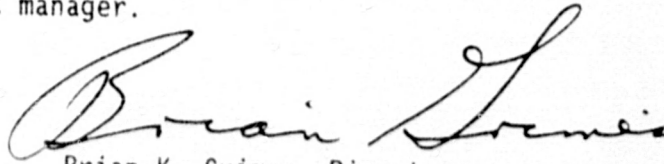
In 1990, Westinghouse sold its relay division, which manufactures the SBFU and SA-1 relays, to ASEA Brown Boveri (ABB). ABB, which now has the 10 CFR Part 21 reporting responsibility, is not certain that all potentially affected licensees have been alerted to the problem with the zener diodes. The relay division of ABB mailed the attached product advisory letter (PAL 94-98) to its known customers. The NRC is forwarding PAL 94-98, without attachments, as an attachment to this information notice to ensure that all nuclear power plants using these relays are aware of the problem.

Related Generic Communications

The NRC has issued the following generic communications related to this problem:

1. Information Notice 83-63, "Potential Failures of Westinghouse Electric Corporation Type SA-1 Differential Relays," September 26, 1983
2. Information Notice 83-63, Supplement 1, February 15, 1984

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.



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

Technical contact: Kamalakar R. Naidu, NRR
(301) 504-2980

Attachments:

1. ABB Product Advisory Letter PAL 94-98, w/o atts
2. List of Recently Issued NRC Information Notices

Dear Customer,

This Product Advisory Letter (PAL 94-98) has been sent to advise you of a possible component failure that can cause a false operation in the commercial grade SA-1 Generator Differential relay and the SBFU Static Breaker Failure relay. (Class 1E SA-1 is not affected--see note below).

The SA-1 relay was first manufactured during 1959. In 1964 the SA-1 relay was re-designed with a zener diode (Z3) in parallel with the trip SCR for additional transient protection. During the years 1964 to 1974, various false operations were reported with some other solid-state relays that had similar thyristor (SCR) trip output circuits with zener protection due to the failure (shorting) of the zener and as a result, this component was removed from the production SA-1 in 1974. In 1984 a false trip of a pre 1974 SA-1 was again traced to the failure of the zener protection diode with the recommendation to that user at that time, by Westinghouse, to remove the device.

While there have been no additional reported false operations due to zener failure since 1984, ABB believes you should be aware of this problem on any SA-1 relay you purchased between 1964 and 1974 that may still be in service, as it is recommended this zener (Z3) diode be removed. Please refer to the attached information for the location of zener diode (Z3).

Note: The Class 1E SA-1 (S/N 1329D62A01) was designed in 1977 without SCR zener protection and is not effected with the problem outlined in this PAL.

In 1991 a false operation of an SBFU Static Breaker Failure relay was reported. This false operation was traced to the failure (shorting) of the SCR transient protection zeners Z1 and Z2 in the SBFU trip module (S/N 899C826G01). These zener diodes were added to this module in 1970, thus any SBFU purchased before 1970 is not effected with this problem. In 1973 the trip module was re-designed to style number 265C975G01 and these protection zeners were eliminated.

Note: The SBFU was not manufactured as a Class 1E qualified relay.

There have not been any additional reported false operations of SBFU's due to zener failures, but ABB recommends the SBFU module (S/N 899C826G01) be examined for zeners Z1 and Z2 if the unit

was purchased between 1970 and 1973. If this module has Z1 and Z2, it is recommended these devices be removed. Please refer to the attached figures for the location of Z1 and Z2.

If after review of this information you should have any questions, please contact Russ Gonnam or John Wilson at 305-752-6700 or 305-345-5329 (Fax).

Note: The manufacturer of the product involved in this Advisory is Westinghouse Electric Corporation. ABB Power T&D Company Inc. acquired from Westinghouse in late December of 1989 that portion of Westinghouse's business which manufactures electrical equipment similar to that involved in this Advisory. Although ABB Power T&D Company Inc. is a successor to certain businesses of Westinghouse, Westinghouse has retained complete liability for products manufactured prior to February 14, 1989. The product which is the subject of this Advisory was made by Westinghouse and not ABB Power T&D Company Inc. In providing guidance in the form of this Advisory, ABB Power T&D Company Inc. assumes no responsibility whatsoever for the product manufactured by Westinghouse.

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-35	NIOSH Respirator User Notices, "Inadvertent Separation of the Mask-Mounted Regulator (MMR) from the Facepiece on the Mine Safety Appliances (MSA) Company MMR Self-Contained Breathing Apparatus (SCBA) and Status Update"	05/16/94	All holders of OLs or CPs for nuclear power reactors, and all licensed fuel facilities.
94-34	Thermo-Lag 330-660 Flexi-Blanket Ampacity Derating Concerns	05/13/94	All holders of OLs or CPs for nuclear power reactors.
94-33	Capacitor Failures in Westinghouse Eagle 21 Plant Protection Systems	05/09/94	All holders of OLs or CPs for nuclear power reactors.
93-53, Supp. 1	Effect of Hurricane Andrew on Turkey Point Nuclear Generating Station and Lessons Learned	04/29/94	All holders of OLs or CPs for nuclear power reactors.
94-32	Revised Seismic Hazard Estimates	04/29/94	All holders of OLs or CPs for nuclear power reactors.
94-31	Potential Failure of Wilco, Lexan-Type HN-4-L Fire Hose Nozzles	04/14/94	All holders of OLs or CPs for nuclear power reactors.
90-68, Supp. 1	Stress Corrosion Cracking of Reactor Coolant Pump Bolts	04/14/94	All holders of OL or CPs for pressurized water reactors.
94-30	Leaking Shutdown Cooling Isolation Valves at Cooper Nuclear Station	04/12/94	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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In 1990, Westinghouse sold its relay division, which manufactures the SBFU and SA-1 relays, to ASEA Brown Boveri (ABB). ABB, which now has the 10 CFR Part 21 reporting responsibility, is not certain that all potentially affected licensees have been alerted to the problem with the zener diodes. The relay division of ABB mailed the attached product advisory letter (PAL 94-98) to its known customers. The NRC is forwarding PAL 94-98, without attachments, as an attachment to this information notice to ensure that all nuclear power plants using these relays are aware of the problem.

Related Generic Communications

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2. Information Notice 83-63, Supplement 1, February 15, 1984

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orig /s/'d by BKCrimes

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

Technical contact: Kamalakar R. Naidu, NRR
(301) 504-2980

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*SEE PREVIOUS CONCURRENCE

OFFICE	*OGCB/DORS	*TECH ED.	*VIB/DRIL	*VIB/DRIL	*VIB/DRIL
NAME	CVHodge	JMain	KNaidu	GCwalina	LNorrholm
DATE	03/24/94	03/29/94	02/22/94	03/07/94	03/07/94
OFFICE	*DRIL/NRR	*C:EELB/NRR	*AC:OGCB/DORS	D:DORS/NRR	
NAME	CERossi	CHBerlinger	AJKugler	BKGrimes	
DATE	03/10/94	04/13/94	04/19/94	05/16/94	

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NAME	CERossi	CHBerlinger	AJKugler	BKGrimes
DATE	03/10/94	04/13/94	04/19/94	04/ /94

OFFICIAL RECORD COPY DOCUMENT NAME: ZENERDIO.INF

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NAME	CVHodge <i>wh</i>	JMain <i>gm</i>	KNaidu	GCwalina	LNorrholm	CERossi
DATE	03/24/94	03/29/94	02/22/94	03/07/94	03/07/94	03/10/94

OFFICE	AC:OGCB/DORS	D:DORS/NRR
NAME	AJKugler	BKGrimes
DATE	03/ /94	03/ /94

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Technical contact : Kamalakar R. Naidu, NRR
(301) 504-2981

Attachment:

ABB Product Advisory Letter PAL 94-98

List of Recently Issued NRC Information Notices

OFFICE	VIB/DRIL	VIB/DRIL	VIB/DRIL	DRIL/NRR	AC:OGCB/DORS
NAME	KNaidu	GCwalina	LNorrholm	CEBosst	A. J. Kugler
DATE	2/22/94	3/7/94	3/17/94	3/11/94	1/94
COPY	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICE	
NAME	BGrimes
DATE	/ /94
COPY	YES NO

OFFICIAL RECORD COPY

DOCUMENT NAME: ZENER DIODES