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

April 18, 1988

NRC INFORMATION NOTICE NO. 88-14: POTENTIAL PROBLEMS WITH ELECTRICAL RELAYS

Addressees:

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

Purpose:

This information notice is being provided to alert recipients to potential problems involving HFA, PVD 21B, PVD 21D, and HGA relays manufactured by General Electric Company (GE), as described below. Although some of these problems are several years old, they are included because utilities are still identifying problems discovered while implementing advice issued by GE in the early 1980s. The specific problem with the HFA relays concerns mechanical binding in the relay caused by incorrect location of a stop tab that is welded to the armature. The problems with the PVD 21B, PVD 21D, and HGA concern their seismic capability. It is expected that licensees will review this information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

a. HFA Relays

In June 1986, Duane Arnold Energy Center reported that HFA relays were not resetting. GE determined, after investigation, that mechanical binding in the relays prevented the normally closed contacts from making contact when the relays were de-energized. This was caused by the incorrect location of a stop tab that is welded to the armature. The incorrect location, combined with possible movement of the magnetic assembly, causes the armature binding. In July 1986, TVA experienced similar problems.

On July 21, 1986, the GE Meter and Control Business Division (MCBD), Malvern, Pennsylvania, issued a 10 CFR Part 21 report to the NRC. On November 14, 1986, MCBD issued Service Advice Letter (SAL) 188.1, which instructed recipients to test the relay to identify and correct improper operation. The SAL stated that MCBD could not determine when the stop tab problem had begun, but that relays manufactured between January 1983 and October 1986 were suspect. Date codes were provided that could be

used to identify potentially affected relays. However, on June 5, 1987, Pilgrim implemented SAL 188.1 and identified several improperly operating relays which were manufactured outside the suspected date codes.

In view of this, all HFA relays may be suspect. Additionally, the NRC recently issued NRC Bulletin 88-03, "Inadequate Latch Engagement in HFA Type Latching Relays Manufactured by General Electric (GE) Company," March 10, 1988, regarding problems from inadequate latch engagement.

b. PVD 21B and PVD 21D Relays (see Attachment 1)

In 1977, GE listed the seismic capability of the normally open contacts of the PVD 21B and PVD 21D differential relays as 6g zero period acceleration (ZPA) with the relay energized and the contacts closed. The tripping of each of these relays in response to differential over current is by a "low set" voltage unit, device 87L, and a "high set" current unit, device 87H. Device 87L is an instantaneous voltage unit that has its coil connected across the dc terminals of a full wave rectifier device. Device 87L has two sets of normally open contacts, one of which is connected in parallel with the contacts of the seal-in unit. Device 87H is an instantaneous overcurrent unit, with its coil connected in series with thyrite discs; it has a single set of normally open contacts.

Originally, GE published data which implied that the seismic capability of 6g ZPA applied equally to both 87H and 87L functions. In 1983, GE revised the seismic capabilities as follows: the capability of the 87L function remained at 6g ZPA, and the capability of the 87H function was reduced to 2g ZPA. GE stated that the 87H set of normally open contacts is generally wired in parallel with both the open 87L contacts and the open 87L seal-in contacts when the PVD relay is used to trip a circuit breaker. GE stated that the 87H function of the PVD is less sensitive than the 87L function (it requires more operating signal). As a result, opening the normally open 87H contacts for a time greater than 2 milliseconds as a consequence of a seismic event between 2g and 6g ZPA should not interfere with tripping the circuit breaker because the parallel 87L contact would remain closed up to 6g ZPA. In view of the 2g ZPA seismic capability of the 87H contact, GE recommended the application be checked if the 87H contacts are used separately for any functions other than tripping.

c. HGA Relays (see Attachment 1)

During a re-evaluation of qualification data for relays used in nuclear Class 1E systems, MCBD determined that the seismic data for HGA 11 and HGA 111 relays published in MIL No. RS77-3, dated March 25, 1977, were in error. The incorrect data were revised in MIL No. 82-12, dated July 26, 1982. Specifically, MIL No. RS77-3 listed the seismic capability of the normally closed contacts of ac-rated HGA 11 or HGA 111

relays at 1.0g ZPA when the relays were in the de-energized state. The dc-rated relays were listed at 1.5g ZPA for the same condition. The revised seismic capability of the normally closed contacts of both ac and dc HGA 11 and HGA 111 relays in the de-energized state is less than 0.5g ZPA.

GE has conducted studies to determine design changes that could improve the seismic capability of the normally closed contacts when the relay is de-energized. Additionally, a separate study considered the seismic capability of alternate HGA relay models as a means for improving the seismic capability of normally closed contacts with the relay de-energized. At this time, GE has no plans for development of an HGA relay with improved seismic capability.

On the basis of the above information, GE recommends that Class 1E circuits using normally closed contacts of HGA 11 and HGA 111 relays, with the relay de-energized, be evaluated for the effect on the entire circuit of an HGA 11 or HGA 111 contact opening longer than 2 milliseconds.

On June 24, 1987, Duane Arnold reported to the NRC (1) that, based on the revised data, HGA 11 relays providing critical functions in the core spray, low pressure coolant injection, high pressure coolant injection, and reactor core isolation cooling systems at Duane Arnold have indeterminate qualification, and (2) that the relays were being replaced.

Discussion:

a. HFA Relays

For HFA relays, in addition to SAL 188.1, GE issued the following SALs:

(1) SAL 139.2, dated April 28, 1976. This SAL superseded SAL 139.1, dated September 5, 1973.

(2) SAL 152.1, dated April 28, 1976.

(3) SAL 152.2, dated November 3, 1980.

(4) SAL 152.2A, dated March 12, 1982.

(5) SAL 169.1, dated May 28, 1982.

b. PVD 21 Relays

For PVD 21 relays, GE issued SAL 174.1 dated April 11, 1983. This SAL provided clarification of the seismic capability of the 87H and 87L contacts.

Most plants using PVD and HGA style relays are subject to the verification of seismic adequacy of mechanical and electrical equipment under Unresolved Safety Issue (USI) A-46 (as outlined in Generic Letter 87-02). However, PVD and HGA style relays have also been found in newer plants that are not subject to Generic Letter 87-02 (e.g., Susquehanna Unit 2 LER 86-024-000).

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the technical contact listed below or the Regional Administrator of the appropriate regional office.

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

Technical Contact: K. R. Naidu, NRR
(301) 492-0980

Attachments:
1. General Electric Letter to NRC
   dated February 24, 1983
2. List of Recently Issued NRC Information Notices

Attachment 1

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, 205 GREAT VALLEY PARKWAY, MALVERN, PA 19355-0715
Phone (215) 251-7000

POWER SYSTEMS
MANAGEMENT
BUSINESS
DEPARTMENT

February 24, 1983

Mr. Richard DeYoung
Director of Office of Inspection and Enforcement
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. DeYoung:

Attached is a copy of a letter relating to PVD21B and PVD 21D relays and a copy of a letter relating to HGA11 and HGA111 relays addressed to customers we have knowledge of who may be applying these devices in nuclear installations.

It is our understanding that this fulfills our obligation to the Nuclear Regulatory Commission.

Yours truly,

L. L. Mankoff
Manager-Engineering

LLM/gs

Attachment

cc: E. J. Fierko Malvern-1203
T. R. Macon Malvern-1205
M. J. Murray Malvern-1206
V. Thomas NRC

PVD21B and PVD21D SEISMIC CAPABILITY

During a re-evaluation of qualification data for relays used in nuclear 1E systems, some seismic data for PVD 21 relays published in MIL No. RS77-3, March 25, 1977 were found to be in error. The incorrect data were subsequently revised in part in MIL No. 82-12, dated July 26, 1982. The correct data for these relays are 6 g ZPA for the 87L function and 2 g ZPA for the 87H function.

The normally open contacts of the PVD21B and PVD21D relays were listed in MIL No. RS77-3 as having a 6 g ZPA capability when these contacts were closed with the relay in the operate mode. During the period December 19, 1980 through April 27, 1981, a few Nuclear Certification documents were issued with a revised value of 4 g ZPA. Certifications issued after April 27, 1981 through January 17, 1983 listed the seismic capability at 2 g ZPA. For each of the above cases, the seismic capability was implied to apply equally to the 87H and 87L functions, the two tripping modes of the relay.

The seismic capability of the 87L function was correct at 6 g ZPA. The seismic capability of the 87H function should have been listed as 2 g ZPA. The 87H normally open contact is generally applied in parallel with the normally open 87L contact and normally open 87L seal-in contact when the PVD relay is used to trip a circuit breaker. The 87H function of the PVD is less sensitive than the 87L function, (requires more operating signal), therefore opening of the normally open 87H contact for a time greater than two milliseconds as a consequence of a seismic event between 2 and 6 g ZPA, should not interfere with tripping the circuit breaker because the parallel 87L contact would remain closed up to 6 g ZPA.

If the 87H contact is used separately for any functions other than tripping, the application should be checked in view of the 2 g ZPA seismic capability of the 87H contact.

HGA11 and HGA111 SEISMIC CAPABILITY - NORMALLY CLOSED CONTACTS

During a re-evaluation of qualification data for relays used in nuclear 1E systems, some seismic data for HGA11 and HGA111 relays published in MIL No. RS77-3, March 25, 1977 were found to be in error. The incorrect data were subsequently revised in MIL No. 82-12, dated July 26, 1982.

The normally closed contacts of AC rated HGA11 or HGA111 relays were listed in MIL No. RS77-3 as having a 1 g ZPA seismic capability when the relays were in the de-energized state. The DC rated relays were listed as having 1.5 g ZPA capability for the same condition. A value of 0.5 g ZPA should have been listed for the normally closed contacts of both relays in the de-energized state.

HGA111 relays were recently re-tested for seismic capability and the values obtained for normally closed contacts with the relay de-energized were less than the 0.5 g ZPA low limit of the test equipment.

Studies are underway to determine if there are design changes which could increase the seismic capability of the normally closed contacts when the relay is de-energized. In addition, a separate study will consider the seismic capabilities of alternate models of HGA relays as a means for improving seismic capability of normally closed contacts with the relay de-energized.

Based on the preceding information, it is recommended that Class 1E circuits using HGA11 or HGA111 normally closed contacts with the relay de-energized be evaluated for effect on the entire circuit of an HGA11 or HGA111 contact opening exceeding two milliseconds duration.

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-13	Water Hammer and Possible Piping Damage Caused by Misapplication of Kerotest Packless Metal Diaphragm Globe Valves	4/18/88	All holders of OLs or CPs for nuclear power reactors.
88-12	Overgreasing of Electric Motor Bearings	4/12/88	All holders of OLs or CPs for nuclear power reactors.
88-11	Potential Loss of Motor Control Center and/or Switchboard Function Due to Faulty Tie Bolts	4/7/88	All holders of OLs or CPs for nuclear power reactors.
88-10	Materials Licensees: Lack of Management Controls Over Licensed Programs	3/28/88	All NRC licensees authorized to use byproduct material.
87-44, Supp. 1	Thimble Tube Thinning in Westinghouse Reactors	3/28/88	All holders of OLs or CPs for nuclear power reactors that employ a Westinghouse NSSS.
88-09	Reduced Reliability of Steam-Driven Auxiliary Feedwater Pumps Caused by Instability of Woodward PG-PL Governors	3/18/88	All holders of OLs or CPs for nuclear power reactors.
88-08	Chemical Reactions with Radioactive Waste Solidification Agents	3/14/88	All NRC licensees generating or processing low level radioactive waste.

OL = Operating License
CP = Construction Permit

Most plants using PVD and HGA style relays are subject to the verification of seismic adequacy of mechanical and electrical equipment under Unresolved Safety Issue (USI) A-46 (as outlined in Generic Letter 87-02). However, PVD and HGA style relays have also been found in newer plants that are not subject to Generic Letter 87-02 (e.g., Susquehanna Unit 2 LER 86-024-000).

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2. List of Recently Issued NRC Information Notices

*SEE PREVIOUS CONCURRENCES

		D/DOEA:NRR	*C/OGCB:DOEA:NRR	*D/DRIS:NRR
		CERossi	CHBerlinger	JGPartlow
		04/15/88	03/11/88	03/15/88
*OGCB:DOEA:NRR	*VIB:DRIS:NRR	*SC/VIB:DRIS:NRR	*A/BC/VIB:DRIS:NRR	PPMB:ARM
BMann	KNaidu	EBaker	JStone	TechEd
02/23/88	02/23/88	02/24/88	02/24/88	03/11/88

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Technical Contact: K. R. Naidu, NRR
(301) 492-9659

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		CERossi	CHBerlinger	for JGPartlow
		03/ /88	03/11/88	03/15/88
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*SEE PREVIOUS CONCURRENCES

CNB 3/4/88

			D/DOEA:NRR	*C/OGCB:DOEA:NRR
			CERossi	CHBerlinger
			02/ /88	02/29/88
*OGCB:DOEA:NRR	*VIB:DRIS:NRR	*SC/VIB:DRIS:NRR	*A/BC/VIB:DRIS:NRR	PPMB:ARM
BMann	KNaidu	EBaker	JStone	TechEd Roy Sanders
02/23/88	02/23/88	02/24/88	02/24/88	02/ /88

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Editorial Comments noted.