

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

November 16, 1988

NRC INFORMATION NOTICE NO.: 88-88: DEGRADATION OF WESTINGHOUSE ARD RELAYS

Addressees:

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

Purpose:

This information notice is being provided to alert addressees to problems identified in Westinghouse ARD relays. It is expected that recipients will review the information for applicability to their facility 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:

Pacific Gas and Electric Co. (PG&E or licensee) notified the Nuclear Regulatory Commission of a deficiency identified in Westinghouse ARD relays at its Diablo Canyon Power Plant, Unit 1, in Licensee Event Report (LER) 50-275/88-009, dated May 26, 1988. PG&E indicated that during the period from December 1, 1987, to April 7, 1988, seven Westinghouse 125-Vdc ARD relays were found to have increased drag between the solenoid's coil spool and the armature.

Discussion:

PG&E reported in their LER that during an investigation of load fluctuations on diesel generator (DG) 1-1 on December 1, 1987, a 125-Vdc Westinghouse ARD relay solenoid armature was found to have an increased drag. The relay was replaced the following day after the problem was attributed to an increased resistance caused by dust on the relay contacts. In February 1988, during replacement of equivalent relays in the Unit 1 and Unit 2 DGs, four ARD relays were found to have increased drag on the solenoid armature. PG&E determined that the increased drag was caused by granules from the coil potting compound lodging between the solenoid's coil spool and the armature that moves inside the coil spool. The coil potting compound, a sand-based material, had apparently deteriorated, and granules had migrated to the coil spool area where they lodged between the coil spool and the armature. The increased solenoid armature drag resulted in increased relay contact resistance that affected the signal transmitted by these relays in low-voltage and voltage-sensitive circuits. The relays are Westinghouse 8-pole relays with 125/130-Vdc coils, catalog numbers ARD440 and ARD660.

8811090403

ZA

IDR-11C

The licensee replaced the four relays and to confirm the cause of the failures, sent three of these relays to Westinghouse for further analysis. Westinghouse informed PG&E that the relay failures were indeed caused by the potting compound granules lodging between the coil spool and the armature. Further investigation by the licensee and Westinghouse determined that sand-based coil potting compound had been used in certain 125-Vdc relays manufactured before 1972. The resin used in the potting material apparently breaks down with age. Westinghouse recognized this type of degradation in the 1970s and thereafter ceased to use a sand-based potting compound in relays qualified by them as Class 1E components. PG&E purchased the relays as commercial grade and was not aware of the aging characteristic of the potting material.

According to PG&E and Westinghouse, in-place identification of relays with a sand-based potting compound may be possible through a close inspection of the coil terminal tab. A rectangular opening in this tab where it enters the coil block may reveal a small sample of the potting material. A light brown, coarse-appearing potting material is suspected as being sand based. Black or yellow-brown, smooth-appearing material does not demonstrate the same degradation.

During the performance of planned maintenance on April 7, 1988, PG&E personnel identified two additional 125-Vdc Westinghouse ARD relays with increased drag. PG&E personnel have replaced all the relays identified to have the increased drag with relays that do not use a sand-based potting compound. The remaining installed ARD relays with a sand-based potting compound are scheduled to be replaced by PG&E.

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

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

Technical Contact: Jaime Guillen, NRR  
(301) 492-1170

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-87	Pump Wear and Foreign Objects in Plant Piping Systems	11/16/88	All holders of OLs or CPs for nuclear power reactors.
86-106, Supp. 3	Feedwater Line Break	11/10/88	All holders of OLs or CPs for nuclear power reactors.
88-86	Operating with Multiple Grounds in Direct Current Distribution Systems	10/21/88	All holders of OLs or CPs for nuclear power reactors.
88-85	Broken Retaining Block Studs on Anchor Darling Check Valves	10/14/88	All holders of OLs or CPs for nuclear power reactors.
88-84	Defective Motor Shaft Keys in Limitorque Motor Actuators	10/20/88	All holders of OLs or CPs for nuclear power reactors.
88-83	Inadequate Testing of Relay Contacts in Safety-Related Logic Systems	10/19/88	All holders of OLs or CPs for nuclear power reactors.
88-82	Torus Shells with Corrosion and Degraded Coatings in BWR Containments	10/14/88	All holders of OLs or CPs for BWRs.
88-81	Failure of Amp Window Indent Kynar Splices and Thomas and Betts Nylon Wire Caps During Environmental Qualification Testing	10/7/88	All holders of OLs or CPs for nuclear power, test, and research reactors.
88-80	Unexpected Piping Movement Attributed to Thermal Stratification	10/7/88	All holders of OLs or CPs for PWRs.
88-79	Misuse of Flashing Lights for High Radiation Area Controls	10/7/88	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
 CP = Construction Permit

The licensee replaced the four relays and to confirm the cause of the failures, sent three of these relays to Westinghouse for further analysis. Westinghouse informed PG&E that the relay failures were indeed caused by the potting compound granules lodging between the coil spool and the armature. Further investigation by the licensee and Westinghouse determined that sand-based coil potting compound had been used in certain 125-Vdc relays manufactured before 1972. The resin used in the potting material apparently breaks down with age. Westinghouse recognized this type of degradation in the 1970s and thereafter ceased to use a sand-based potting compound in relays qualified by them as Class 1E components. PG&E purchased the relays as commercial grade and was not aware of the aging characteristic of the potting material.

According to PG&E and Westinghouse, in-place identification of relays with a sand-based potting compound may be possible through a close inspection of the coil terminal tab. A rectangular opening in this tab where it enters the coil block may reveal a small sample of the potting material. A light brown, coarse-appearing potting material is suspected as being sand based. Black or yellow-brown, smooth-appearing material does not demonstrate the same degradation.

During the performance of planned maintenance on April 7, 1988, PG&E personnel identified two additional 125-Vdc Westinghouse ARD relays with increased drag. PG&E personnel have replaced all the relays identified to have the increased drag with relays that do not use a sand-based potting compound. The remaining installed ARD relays with a sand-based potting compound are scheduled to be replaced by PG&E.

No specific action or written response is required by this information notice. If you have any questions regarding 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: Jaime Guillen, NRR  
(301) 492-1170

Attachment: List of Recently Issued NRC Information Notices

\*SEE PREVIOUS PAGE FOR CONCURRENCE

OGCB:DOEA:NRR	*PPMB:ARM*	*C/SELB:DEST:NRR	*AD/DEST:NRR	*C/OGCB:DOEA:NRR
JGuillen	TechEd	FRosa	AThadani	CHBerlinger
11/8/88	11/9/88	11/3/88	11/7/88	11/8/88

D/DOEA-NRR  
CERoss1  
11/9/88

The licensee replaced the four relays to confirm the cause of the failures. Three of these relays were sent to Westinghouse for further analysis. Westinghouse informed PG&E that the relay failures were indeed caused by the potting compound granules lodging themselves between the coil spool and the armature. Further investigation by the licensee and Westinghouse determined that sand-based coil potting compound had been used in certain 125-Vdc relays manufactured before 1972. The resin used in the potting material apparently breaks down with age. Westinghouse recognized this type of degradation in the 1970's and thereafter ceased to use a sand-based potting compound in relays qualified by them as class 1E components. PG&E purchased the relays as commercial grade and was not aware of the aging characteristic of the potting material.

According to PG&E and Westinghouse, in-place identification of relays with a sand-based potting compound may be possible through a close inspection of the coil terminal tab. A rectangular opening in this tab where it enters the coil block may reveal a small sample of the potting material. A light brown, coarse-appearing potting material is suspected as being sand based. Black or yellow-brown, smooth-appearing material does not demonstrate the same degradation.

During the performance of planned maintenance on April 7, 1988, PG&E personnel identified two additional 125-Vdc Westinghouse relays with increased drag. PG&E personnel have replaced all the relays identified to have the increased drag with relays that do not use a sand-based potting compound. The remaining installed ARD relays with a sand-based potting compound are scheduled to be replaced by PG&E.

No specific action or written response is required by this information notice. If you have any questions regarding this matter, please contact the technical contacts 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: Jaime Guillen, NRR  
(301) 492-1170

Attachment: List of Recently Issued NRC Information Notices

\*Previously concurred

*JS*  
OGCB/DOEA:NRR  
JGuillen  
10/8/88

*BCalure concurred on 10/14/88*  
PPMB:ARM\*  
TechEd *JK*  
10/9/88

*JK*  
C/SELB/DOEA:NRR  
FRosa *JK*  
11/3/88

*AT* 112  
AD/DEST:NRR114  
ATHadani  
11/7/88

*As modified 11/2/88*  
C/OGCB:DOEA:NRR  
CHBerlinger  
11/8/88

D/DOEA:NRR  
CERossi  
11/ /88