

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT  
WASHINGTON, D.C. 20555

March 9, 1983

IE INFORMATION NOTICE NO. 83-08: COMPONENT FAILURES CAUSED BY ELEVATED DC CONTROL VOLTAGE

Addressees:

All holders of a nuclear power reactor operating license (OL) or construction permit (CP).

Purpose:

This information notice is provided as a notification of a potentially significant problem pertaining to premature degradation or failure of equipment, caused by elevated DC control voltage in safety-related circuits.

Because of the potential safety significance and related generic implications of this problem, addressees are expected to review the information for applicability to their facilities. No specific action or response is required.

Description of Circumstances:

The following three events, covered in Licensee Event Reports (LERs), indicate problems in safety-related DC control circuits where equipment degraded prematurely and caused short circuits and control problems, apparently as a result of DC voltages that exceeded the design voltage.

1. On October 3, 1982, at the Trojan Nuclear Plant, the indicating lamp socket associated with a control switch on a 125V DC system broke and fell into the panel, shorting out associated control circuitry. This caused the fuse to blow, resulting in the loss of control power for the startup of an emergency diesel generator, and thus the diesel startup capability was lost.

This event occurred as a result of an excess voltage condition which led to thermal breakdown of the lamp socket. The 125V DC system continuously subjected the lamp socket to its maximum rated voltage of 130V DC. In this case a higher than nominal operating voltage caused the lamp socket to become brittle because excessive heat was generated and also necessitated more frequent lamp replacement.

On the basis of the results of an engineering evaluation, two cells were removed from each station battery; this reduced the system voltage and battery charger output voltage. The licensee then conducted a load profile test to demonstrate adequate ampere-hour capacity for the design load. The bus voltage did not drop below the minimum acceptable level.

2. On August 30, 1982, during preoperational testing of hydrogen monitors at the Fort Calhoun Nuclear Plant, a control room operator noticed that two associated containment isolation valves had no position indication. One of the solenoid valves had an internally shorted coil; the other valve had a coil shorted to ground. These shorts blew the fuse. The blown fuse caused the loss of valve position indication and allowed the valves to fail open. Followup evaluation indicated that the solenoid valves were intended for service at 125V DC  $\pm$ 10 percent. During the month preceding the failures, the station batteries had been placed on an equalizing charge of 140V DC. The licensee concluded that this elevated voltage caused the valves to fail since they remained energized for the entire period of time.

The licensee intends to replace all solenoid valve coils with coils designed to operate at a higher voltage.

3. On March 15, 1982, at the Zion Nuclear Generating Station, a relay coil in a safety related reactor trip relay burned up and failed in a nonconservative mode. The failed relay coil was a replacement and had been rated at 120V DC; whereas the original relay coil had been rated at 125/130V DC. The licensee concluded that the replaced relay coil failed as the result of overheating that had been caused by five years of operation at elevated voltage. During a follow-up evaluation, five additional relays with 120V DC coil rating in a 130V DC system were identified. These relays were replaced.

These events show that DC safety-related control components and indicating circuit components which operate for a sustained period of time at elevated voltages or voltages above their rated design voltage are subject to accelerated degradation which may have some impact on plant safety. A careful balance of rated voltage for components in DC systems must be maintained to assure maximum voltage during equalizing charging doesn't adversely affect components and that those components which are required to function in an emergency remain operable at minimum battery voltages at design ampere-hour capacity.

No written response to this notice is required. If you have any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC Regional Office, or this office.



Edward L. Jordan, Director  
Division of Emergency Preparedness  
and Engineering Response  
Office of Inspection and Enforcement

Technical Contact: W. Laudan  
301-492-9759

Attachment:  
List of Recently Issued Information Notices

LIST OF RECENTLY ISSUED  
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
83-07	Nonconformities with Materials Supplied by Tube Line Corporation	03/07/83	All power reactor facilities holding an OL or CP
83-06	Nonidentical Replacement Parts	02/24/83	All power reactor facilities holding an OL or CP
83-05	Obtaining Approval for Disposing of Very-Low-Level Radioactive Waste - 10 CFR Section 20.302	02/24/83	All production and utilization facilities including nuclear power reactors and research and test reactors, holding an OL
83-04	Failure of ELMA Power Supply Units	02/18/83	All power reactor facilities holding an OL or CP
83-03	Calibration of Liquid Level	01/28/83	All power reactor facilities holding an OL or CP
83-02	Limiterque HOBC, H1BC, H2BC, and H3BC Gearheads	01/28/83	All power reactor facilities holding an OL or CP
83-01	Ray Miller, Inc.	01/26/83	All power reactor facilities holding an OL or CP
82-56	Robertshaw Thermostatic Flow Control Valves	12/30/82	All power reactor facilities holding an OL or CP
82-55	Seismic qualification of Westinghouse AR relay with latch attachments used in Westinghouse solid state protection system	12/28/82	All power reactor facilities holding an OL or CP

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OL = Operating License  
CP = Construction Permit

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