

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

October 21, 1968

NRC INFORMATION NOTICE NO. 88-86: OPERATING WITH MULTIPLE GROUNDS IN  
DIRECT CURRENT DISTRIBUTION SYSTEMS

Addressees:

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

Purpose:

This information notice is being provided to alert addressees to potential problems caused by plants operating with ground(s) in the vital direct current (dc) distribution systems (which are normally ungrounded systems). 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

During recent NRC maintenance inspections at Quad Cities (50-254/88011 and 50-265/88012), Oconee (50-269/88-17, 50-270/88-17, and 50-287/88-17), and D. C. Cook (50-315/88016 and 50-316/88018) power reactor facilities, it was found that plants had been operating with multiple grounds in the dc distribution systems for extended periods. Specific examples are as follows:

- (1) Quad Cities Unit 2 operated for a significant period of time with known grounds on the negative side of the 125-Vdc system. During this period, when a momentary ground occurred on the positive side of the circuit a fuse in the auto-start circuitry of a diesel generator blew, disabling the auto-start function of the diesel generator for approximately 6 months. This condition was not properly recognized or evaluated by the licensee; it was identified during an 18-month surveillance test.
- (2) Oconee Nuclear Station operated for approximately 4 months with the 125-Vdc system ground alarm activated. However, during this period no station procedure or shift surveillance requirements existed to verify the operability of the ground detection system. As a result of the maintenance inspections, this ground detection alarm system was found to be inoperable; it had not been calibrated since 1976.

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- (3) D. C. Cook Unit 1 had a negative dc system ground for approximately 7 months before it was cleared. A safety evaluation for continued operation with the ground or other grounds that might be masked had never been performed until requested by the NRC.

The licensees of Quad Cities and D. C. Cook were issued notices of violation. Safety evaluations were performed to support continued operation while the grounds existed.

A review of selected licensee event reports of dc system grounds (see Attachment 1) indicates that plant equipment is frequently rendered inoperable or is started unexpectedly because of grounds.

Discussion:

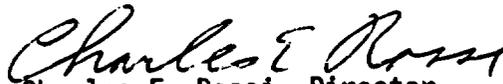
The dc power system provides control and power to safety-related valves, instrumentation, emergency diesel generators, and many other components and systems during all phases of plant operation, including abnormal shutdowns and accident situations. Because of its importance to plant safety, the dc system requires a high degree of reliability and availability.

Most nuclear power plant dc systems are two-wire ungrounded, combination battery/charger systems equipped with ground detection. Typical ground detection system features include a remote annunciator and a local indicator and/or recorder. Ground detectors are incorporated in the dc system so that if a single ground point does occur, immediate steps can be taken to clear the ground fault from the system.

Failure to respond to a single ground will mask subsequent grounds. Multiple grounds can cause the indiscriminate operation of equipment, which may have safety consequences. Grounds can cause control circuit fuses to fail and can render important safety equipment inoperable as previously described. Furthermore, batteries have a designed capacity to supply power during a station blackout condition, and this capacity can be affected by the presence of unanalyzed loads in the form of multiple grounds.

It is recognized that troubleshooting and finding grounds on a dc system are difficult tasks that may affect plant operation. The licensees previously mentioned have reviewed their designs and conditions for potential impact on safety system operability and have taken corrective actions to minimize the effect of grounds.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact one of 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 Contacts: Z. Falevits, Region III  
(312) 790-5772

S. N. Saba, NRR  
(301) 492-1052

Attachments:

1. Selected Licensee Event Reports
2. List of Recently Issued NRC Information Notices

Selected Licensee Event Reports

Event No.: 50-454/86-03 (Byron, Unit 1)

Abstract: A reactor trip and auxiliary feedwater actuation occurred. The trip was caused by grounds on the positive and negative sides of the 125-Vdc bus. The grounded circuit energized a fast-close solenoid on the 1A main steam isolation valve (MSIV). When the MSIV closed, a reactor trip resulted from steam generator low-low level.

Event No.: 50-369/82-48 (McGuire, Unit 1)

Abstract: After the battery trouble alarm actuated, it was noticed that neither the closed nor the open indication light was energized on the pressurizer power-operated relief valve and the valve would not operate. A ground that had blown a fuse in the control circuit was identified.

Event No.: 50-293/82-53/03L-0 (Pilgrim)

Abstract: A ground fault alarm was observed on the 125-Vdc battery circuit. The ground was traced to the limit switch circuitry for a motor-operated valve. The high-pressure coolant injection system was subsequently declared inoperable.

Event No.: 50-305/85-04 (Kewaunee)

Abstract: A control room operator noticed the reactor coolant pump running while the control switch indicated a green flag or off condition. Subsequent investigation revealed that the pump had inadvertently started because of a ground condition in the 125-Vdc actuation circuitry associated with the 4.16 kV switchgear.

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
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.
88-69, Supp 1	Movable Contact Finger Binding in HFA Relays Manufactured by General Electric (GE)	9/29/88	All holders of OLs or CPs for nuclear power reactors.
88-78	Implementation of Revised NRC-Administered Recualification Examinations	9/22/88	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
 CP = Construction Permit

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\*SEE PREVIOUS PAGE FOR CONCURRENCE

*Region III	*OGCB:DOEA:NRR	*SELB:DEST:NRR	*SC/SELB:DEST:NRR
ZFalevits	PCWen	SNSaba	DTondi
10/5/88	10/5/88	10/5/88	10/5/88
*C/SELB:DEST:NRR	*PPMB:ARM	*C/OGCB:DOEA:NRR	B:DOEA
FRosa	TechEd	CHBerlinger	CERoss1
10/11/88	10/12/88	10/13/88	10/17/88

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<i>PCW for</i> Region III ZFalevits 10/5/88 <i>per tel. conv.</i>	<i>PCW</i> OGCB:DOEA:NRR PCWen 10/5/88	SELB:DEST:NRR SNSaba <i>SNS</i> 10/5/88	SC/SELB:DEST:NRR DTondi <i>DT</i> 10/5/88
C/SELB:DEST:NRR FRosa <i>FR</i> 10/11/88	PPMB:ARM <i>B. Culture</i> TechEd 10/12/88	C/OGCB:DOEA:NRR <i>AK</i> CHBerlinger 10/12/88	D:DOEA CERossi 10/ /88