

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

Jim McKnight
0-5F22

September 27, 1994

NRC INFORMATION NOTICE 94-68: SAFETY-RELATED EQUIPMENT FAILURES CAUSED BY FAULTED INDICATING LAMPS

Addressees

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

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the possibility that indicating lamp failures in safety-related circuits could cause safety-related equipment to become inoperable. 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.

Description of Circumstances

On December 14, 1993, at the Wolf Creek Generating Station, a local indicating lamp for a motor control center short-circuited in such a manner that it caused the control power transformer secondary fuse to open, making the "B" centrifugal charging pump room cooler inoperable. The heat from the increased current flow in the lamp was sufficient to melt a hole in the lens cover.

At Indian Point Unit 3, on February 9, 1992, an indicating lamp on the Train A safeguards initiation rack failed in a manner that caused a short-circuit that blew a 10-ampere fuse in the dc control power circuit. This disabled the automatic initiation feature of the Train A safeguards components, which consisted of a safety injection pump, a containment spray pump, two containment fan cooler units, an essential service water pump, a component cooling water pump, and the Train A motor-operated valves. The lamp circuit did not have a current-limiting element. The licensee attempted to correct the problem by replacing the incandescent light bulbs with LEDs. However, during the replacement excess solder in an LED assembly lamp base caused another short-circuit, blowing a fuse and extinguishing two racks of LEDs.

9409210064

PDR I&E Notice 94-068
update

ID&R-11c
Information Notice

940927

DF03

Similar events had occurred previously at Indian Point Unit 3. On January 23, 1992, an electrical fault in an indicating lamp on the local control panel for the auxiliary boiler feed pump blew a 6.25-ampere control power fuse, disabling the automatic initiation feature of the safeguards equipment on a 480-V vital bus. On October 15, 1991, an electrical fault in an indicating lamp on safeguards initiation Train B blew a 10-ampere control power fuse, disabling the automatic initiation feature of the Train B safeguards components.

Discussion

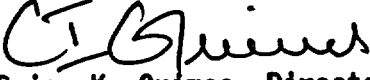
At Wolf Creek, similar local indicating lamps were used in other safety-related motor control center starters in addition to the one that failed. These included those for the boron injection tank isolation valves. If the indicating lamp associated with these valves had failed in the same manner as the December 14th failure, these valves could have lost control power, thereby delaying the initiation of high-head safety injection in an accident. This failure could have caused the simultaneous failure of other safety systems as well.

The Wolf Creek licensee replaced all of the incandescent indicating lamps that did not have voltage-reducing transformers with new light-emitting diode (LED) bulbs. The LED bulbs contain internal circuitry that prevents excessive current from being drawn if the LED is short-circuited.

The Indian Point Unit 3 licensee modified all of the dc lamp circuits in the safety-related control circuits that lacked current-limiting features, either by installing fuses for the indicating lamp circuits or by replacing them with assemblies having current-limiting resistors.

These events illustrate a type of design deficiency in which indicating lamps are not electrically isolated from the associated control power circuitry. One method of electrically isolating the indicating lamp circuit from the control power circuit is to add a separate fuse to the lamp power supply circuit. The fuse for that circuit can be integrated with the fuse for the control power circuit, such that a lamp or LED failure does not cause a loss of control power for the associated safety-related circuits. Another method is to replace indicating lamps with lamp assemblies having current-limiting features or resistors so that lamp failures will not cause an excessive surge of current in the control power circuit. In addition, the circuit can be protected from socket faults if the current limiting resistor is part of the circuit rather than the lamp itself.

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 *for*
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contact: D. Nguyen, NRR
(301) 504-3202

Attachment:
List of Recently Issued NRC Information Notices

*ATTACHMENT FILED
IN JACKET.*

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-67	Problem with Henry Pratt Motor-Operated Butterfly Valves	09/26/94	All holders of OLs or CPs for nuclear power reactors.
94-66	Overspeed of Turbine-Driven Pumps Caused by Governor Valve Stem Binding	09/19/94	All holders of OLs or CPs for nuclear power reactors.
94-65	Potential Errors in Manual Brachytherapy Dose Calculations Generated Using a Computerized Treatment Planning System	09/12/94	All U.S. Nuclear Regulatory Commission medical licensees.
94-64	Reactivity Insertion Transient and Accident Limits for High Burnup Fuel	08/31/94	All holders of OLs or CPs for nuclear power reactors and all fuel fabrication licensees.
94-63	Boric Acid Corrosion of Charging Pump Casing Caused by Cladding Cracks	08/30/94	All holders of OLs or CPs for pressurized water reactors.
94-62	Operational Experience on Steam Generator Tube Leaks and Tube Ruptures	08/30/94	All holders of OLs or CPs for pressurized water reactors.
94-61	Corrosion of William Powell Gate Valve Disc Holders	08/25/94	All holders of OLs or CPs for nuclear power reactors.
94-60	Potential Overpressurization of Main Steam System	08/22/94	All holders of OLs or CPs for pressurized-water reactors.
94-30, Supp. 1	Leaking Shutdown Cooling Isolation Valves at Cooper Nuclear Station	08/19/94	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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.

orig /s/'d by CIGrimes/for

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

Technical contact: D. Nguyen, NRR
(301) 504-3202

Attachment:
List of Recently Issued NRC Information Notices

EELB:DE:NRR*
DNguyen
08/29/94

RPB:ADM*
TechEd
08/11/94

EELB:DE:NRR*
FAshe
08/29/94

SC/EELB:DE:NRR*
EWeiss
08/30/94

OGCB:DORS:NRR*
DCKirkpatrick
08/18 /94

C/OGCB:DORS:NRR*
ELDoolittle
09/01/94

C/EELB:DE:NRR*
CHBerlinger
08/31/94

D/DORS:NRR
BKGrimes
09/21/94

CGI
for

Document Name: 94-68.IN

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: D. Nguyen, NRR
(301) 504-3202

Attachment:
List of Recently Issued NRC Information Notices

EELB:DE:NRR
DNgyuen DN
08/29/94

RPB:ADM *OK for*
TechEd *Roy Landers*
08/11/94

EELB:DE:NRR
FAsh *380*
08/29/94

SC/EELB:DE:NRR
EWWeiss
08/30/94

OGCB:DORS:NRR
DCKirkpatrick
08/18/94 *OK*

C/OGCB:DORS:NRR
EJDoonittle
08/10/94

C/EELB:DE:NRR
CHBerlinger *OK*
08/31/94

D/DORS:NRR
BKGrimes
08/ /94

Document Name: G:\DON\LAMPFAIL.IN

mkm