

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

August 16, 1993

NRC INFORMATION NOTICE 93-66: SWITCHOVER TO HOT-LEG INJECTION FOLLOWING
A LOSS-OF-COOLANT ACCIDENT IN PRESSURIZED
WATER REACTORS

Addressees

All holders of operating licenses or construction permits for pressurized water reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to a potential for inadequate core flow as a result of the switchover to the hot-leg injection mode following a loss-of-coolant accident (LOCA) in the event of a single failure. 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 January 8, 1993, Westinghouse issued a formal written report pursuant to Part 21 of Title 10 of the Code of Federal Regulations (10 CFR), on the potential for inadequate core flow as a result of the isolation of the residual heat removal/low-pressure safety injection (RHR/LPSI) pumps from the reactor coolant system (RCS) when aligning them to the RCS hot legs for the hot-leg recirculation mode following a LOCA. A single failure of a valve could prevent the alignment of these pumps to the RCS hot legs. Westinghouse has issued a formal letter to the affected licensees advising them that plant-specific emergency operating procedures (EOPs) may have to be revised to reflect the need to realign the RHR/LPSI pumps to the RCS cold legs to mitigate this situation.

Discussion

General Design Criterion 35 of Appendix A to 10 CFR Part 50, requires a system to provide abundant emergency core cooling following any LOCA. Section 50.46(b)(5) of 10 CFR Part 50 requires long-term core cooling following a

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calculated successful initial operation of the emergency core cooling system (ECCS). The Standard Review Plan, NUREG-0800, Section 6.3 states:

The criteria, supporting analyses, plant design provisions, and operator actions will be reviewed to ensure that there will not be unacceptably high concentrations of boric acid in the core region (resulting in precipitation of a solid phase) during the long-term cooling phase following a postulated LOCA.

A common means of preventing a high concentration of boric acid is to initiate hot-leg injection following a large-break LOCA to flush the core before the boron concentration becomes a concern. On January 8, 1993, Westinghouse issued a 10 CFR Part 21 report that identified the switchover to hot-leg injection as potentially vulnerable to a single failure for several pressurized water reactors (PWRs) with a Westinghouse-designed nuclear steam supply system.

The potential single failure vulnerability for the switchover to hot-leg injection for a medium to large hot-leg LOCA, when high-pressure safety injection (HPSI) flow is being injected into the RCS hot legs and LPSI flow is being injected into the RCS cold legs is described below.

- (1) Switchover to LPSI is initiated by closing the valves in the pipes that provide LPSI flow to the RCS cold legs while the HPSI flow continues to be injected into the RCS hot legs. However, the HPSI flow into the RCS hot legs may not provide adequate long-term core flow is spilling from a hot-leg break.
- (2) In some PWRs, switchover to LPSI into the RCS hot legs is completed by opening a single valve. Single failure of this valve could result in failure to increase the core cooling flow into the RCS hot legs, thereby allowing inadequate long-term core cooling to continue for a hot-leg break.
- (3) Licensee EOPs may not address this situation.

The single failure criterion is defined in 10 CFR Part 50, Appendix A, Definitions and Explanations and is further specified in plant-specific licensing bases.

This issue may also be applicable to Combustion Engineering and Babcock & Wilcox designed PWRs. Therefore, this information notice is addressed to all PWR licensees and holders of PWR construction permits.

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: Warren C. Lyon, NRR
 (301) 504-3892

Attachment:
 List of Recently Issued NRC Information Notices

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OFFICE	OGCB:DORS	TECH ED	SRXB:DSSA	SRXB:DSSA
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C:SRXB:DSSA	D:DSSA	C:OGCB:DORS	D:DORS:NRR
RJones*	AThadani*	GHEMarcus*	BKGrimes
05/06/93	06/26/93	07/02/93	08/10/93

DOCUMENT NAME: 93-66.IN

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C:SRXB:DSSA	D:DSSA	C:OGCB:DORS	D:DORS:NRR
RJones*	AThadani*	GHEMarcus*	BKGrimes <i>off</i>
05/06/93	06/26/93	07/02/93	08/ /93

DOCUMENT NAME: WLOCAA.NEC

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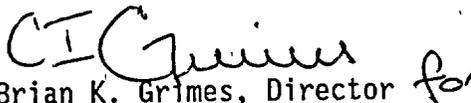
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OFFICE	OGCB:DORS	TECH ED	SRXB:DSSA	SRXB:DSSA
NAME	NECampbell	*RSanders	WLyon	*TCollins
DATE	06/24/93 <i>W.C. Campbell</i>	06/8/93	06/24/93	05/28/93

C:SRXB:DSSA	D:DSSA <i>360</i>	C:OGCB:DORS	D:DORS:NRR
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06/16/93	06/16/93	07/2/93	06/ /93

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Office of Nuclear Reactor Regulation

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Attachment:
List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-65	Reactor Trips Caused by Breaker Testing with Fault Protection Bypassed	08/13/93	All holders of OLs or CPs for nuclear power reactors.
93-64	Periodic Testing and Preventive Maintenance of Molded Case Circuit Breakers	08/12/93	All holders of OLs or CPs for nuclear power reactors
93-63	Improper Use of Soluble Weld Purge Dam Material	08/11/93	All holders of OLs or CPs for nuclear power reactors
93-62	Thermal Stratification of Water in BWR Reactor Vessels	08/10/93	All holders of OLs or CPs for boiling water reactors.
93-61	Excessive Reactor Coolant Leakage Following A Seal Failure in A Reactor Coolant Pump or Reactor Recirculation Pump	08/09/93	All holders of OLs or CPs for nuclear power reactors
93-60	Reporting Fuel Cycle and Materials Events to the NRC Operations Center	08/04/93	All fuel cycle and materials licensees.
93-59	Unexpected Opening of Both Doors in An Airlock	07/26/93	All holders of OLs or CPs for nuclear power reactors.
93-58	Nonconservatism in Low-Temperature Overpressure Protection for Pressurized-Water Reactors	07/26/93	All holders of OLs or CPs for pressurized-water reactors.
93-57	Software Problems Involving Digital Control Console Systems at Non-Power Reactors	07/23/93	All holders of OLs or CPs for test and research reactors and nuclear power reactors.

OL = Operating License
CP = Construction Permit

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