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

March 25, 1994

NRC INFORMATION NOTICE 93-17, REVISION 1: SAFETY SYSTEMS RESPONSE TO LOSS OF COOLANT AND LOSS OF OFFSITE POWER

Addressees

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

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this revision to NRC Information Notice (IN) 93-17, "Safety Systems Response to Loss of Coolant and Loss of Offsite Power," to make it clear that no backfitting was intended or approved by issuance of the original notice and to clarify the recipient applicability under that notice. This revision, like the original, alerts addressees to a condition in which automatic safety systems could have responded inappropriately to certain sequences of loss of coolant and loss of offsite power. 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.

Background

This revision, which supersedes the original IN 93-17, revises portions of the original Description of Circumstances and Discussion to identify more clearly the nature of the loss-of-coolant accident (LOCA) and loss of offsite power sequences addressed by the information notice, and to alleviate a concern that the original notice could be perceived as a backfit for those facility designs that were licensed without demonstrating the capability to respond to the subject sequences. Accordingly, the following revisions have been made to the original notice.

In the Description of Circumstances, the Surry Power Station discussion has been revised to emphasize the more pertinent insight derived from the example (i.e., the diesel generator loading logic was only designed to accommodate a LOCA that occurs exactly at the same time as a loss of offsite power).

In the Discussion section of the notice, clarification is given that the NRC has normally not required that sequences other than simultaneous LOCA and loss of offsite power be analyzed in Chapter 15 of plant Safety Analysis Reports. A change is also made to indicate that the Chapter 15 analysis for a simultaneous LOCA and loss of offsite power may have been used as the basis for the safety system design at some plants. An addition to the end of the first paragraph in the Discussion section makes a clarification that the sequences discussed in Generic Issue 17 are not the subject of this information notice.

The revisions made to the end of the Discussion section clarify that, while the information in this notice may be of interest to all facility designs, not all facilities may be required to demonstrate the ability to cope with this sequence as part of their licensing basis. The NRC staff is considering as a separate generic action whether all facilities should be required to include these design capabilities.

Description of Circumstances

In a report of May 1, 1989, the Virginia Electric Power Company, the licensee for the Surry Power Station, reported a deficiency in the emergency diesel generator (EDG) loading logic that could have resulted in overloading the EDGs if a loss of offsite power had occurred after a LOCA or other design basis event causing the automatic start of the safety system electrical loads. The information supplied by the licensee indicated that consideration had not been given to this sequence of events in the design of the original EDG loading logic. Only a simultaneous LOCA and loss of offsite power was used as the design basis for the EDGs. During recent work on the Improved Standard Technical Specification program and through discussion with nuclear steam supply system owners groups, the NRC has determined that licensees may have similar design logic problems at other plants. The logic at these plants may have been designed to respond properly to a simultaneous LOCA and loss of offsite power but may not be capable of responding to other sequences which may also result in a loss of offsite power because of the characteristics of the particular design.

Discussion

General Design Criteria 17 (GDC 17) of Appendix A to Part 50 of Title 10 of the Code of Federal Regulations requires that, following a loss of offsite power, the onsite power system be sufficient to ensure that the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. Licensees typically include an analysis in Chapter 15 of the plant Safety Analysis Report for a simultaneous occurrence of a loss of offsite power and a LOCA. However, licensees may not always analyze for other possible sequences; the NRC has normally not required that other sequences be analyzed in the Final Safety Analysis Report. Thus, if the Chapter 15 analysis was used as the basis for establishing safety system design, the safety systems in some plants may have been designed to respond properly if these events occurred alone or if they occurred simultaneously, but not for other possible sequences. In its prioritization of Generic Issue 17 regarding loss of offsite power unrelated to the initiating event occurring approximately two minutes after a LOCA and following operator reset of the safety injection signal, the NRC staff determined that that particular sequence had an extremely low probability and concluded that the issue was in the DROP category. That particular LOCA/delayed loss of offsite power sequence is therefore not a concern; however other LOCA and loss of offsite power sequences that occur more rapidly and are a consequence of the initiating event remain a concern.

A LOCA with a delayed loss of offsite power may occur in various ways. In one scenario, the LOCA results in a turbine trip and a loss of power generation to the grid causing grid instability and a subsequent loss of offsite power. In another scenario, the loss of power generation causes a degraded voltage at the plant switchyard, which causes the degraded voltage relays to actuate, resulting in a delayed loss of offsite power to the safety buses. In plants where the safety buses are normally fed from a unit auxiliary transformer normally connected to the output of the main generator, the loss of offsite power could result from a failure of the buses to transfer to the offsite source after the LOCA, or a failure of the offsite transformer to carry the additional load. In such events, offsite power will be lost to the safety buses during the sequencing of the LOCA loads (if LOCA loads are designed to be sequenced on offsite power) or shortly thereafter. The control logic and piping systems (safety injection, service water, etc.) at some plants may not be designed to meet the consequences of such events. Possible adverse results include the failure to re-energize loads required to respond to a LOCA, improper loading and loss of the diesel generators, and water hammer in the piping systems. Depending on the plant design, such sequences may occur as the consequence of the LOCA and not be a result of a separate failure.

The opposite sequence is a loss of offsite power followed by a delayed LOCA. One way in which this sequence could occur is if, after the loss of power occurred, a safety relief valve lifted and failed to reseat properly, resulting in a loss of reactor coolant inventory and a LOCA initiation signal. For most plant designs, sequences such as this may require postulation of a single failure after the loss of offsite power.

The Final Safety Analysis Reports of some licensees clearly describe a design that includes the capability to respond to a LOCA followed by a loss of offsite power and/or a loss of offsite power followed by a LOCA. The design of the control logic, the electrical power and control systems, and the fluid systems all contribute to ensuring that safety systems respond appropriately to these events. Some plant FSARs do not explicitly describe such design capabilities. The NRC staff is considering generic action to determine if all power reactor licensees should be required to demonstrate the subject capabilities.

This information notice revision 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 Grimes

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

Technical contact: James Lazevnick, NRR
(301) 504-2782

Attachment:
List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-25	Failure of Containment Spray Header Valve to Open due to Excessive Pressure from Inertial Effects of Water	03/25/94	All holders of OLs or CPs for nuclear power reactors.
94-24	Inadequate Maintenance of Uninterruptible Power Supplies and Inverters	03/24/94	All holders of OLs or CPs for nuclear power reactors.
94-23	Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program	03/25/94	All NRC Licensees.
94-22	Fire Endurance and Ampacity Derating Test Results for 3-Hour Fire-Rated Thermo-Lag 330-1 Fire Barriers	03/16/94	All holders of OLs or CPs for nuclear power reactors.
94-21	Regulatory Requirements when No Operations are being Performed	03/18/94	All fuel cycle and materials licensees.
94-20	Common-Cause Failures due to Inadequate Design Control and Dedication	03/17/94	All holders of OLs or CPs for nuclear power reactors.
94-19	Emergency Diesel Generator Vulnerability to Failure from Cold Fuel Oil	03/16/94	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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Original signed by
Brian K. Grimes
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*SEE PREVIOUS CONCURRENCE

EELB:DE:NRR	EELB:DE:NRR	C/EELB:DE:NRR
JLazevnick*	DThatcher*	CBerlinger*
11/17/94	11/18/93	01/13/94
OGCB:DORS:NRR	AC/OGCB:DORS:NRR	D/DORS:NRR
JBirmingham*	AJKugler*	BKGrimes
03/18/94	03/18/94	03/22/94

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JBirmingham*	AJKugler	BKGrimes
03/18/94	03/18/94	03/21/94

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