

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

December 11, 2000

NRC INFORMATION NOTICE 2000-20:     POTENTIAL LOSS OF REDUNDANT SAFETY-RELATED EQUIPMENT BECAUSE OF THE LACK OF HIGH-ENERGY LINE BREAK BARRIERS

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 discovery of several high-energy line break (HELB) concerns about redundant safety-related equipment at D. C. Cook Nuclear Plant, Units 1 and 2. A failure of redundant safety-related equipment may result in risk-significant configurations. It is expected that the recipients will review the information for applicability to their facilities and consider corrective actions, as appropriate. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Background

As a result of the numerous safety issues identified at Cook 1 and 2 since August 1997, the NRC analyzed the risk significance of Cook issues using the Accident Sequence Precursor (ASP) program methodology. Of the 141 issues analyzed, four were found to be accident sequence precursors since their conditional core damage frequencies were greater than  $1.0 \times 10^{-6}$ /year. Two of these four issues involved postulated HELB scenarios that may lead to failure of redundant safety-related systems (see Licensee Event Reports (LERs) 316/98-005 and 315/99-026 for details).

Within these two issues there are three scenarios that are described below:

- A break in a Unit 2 main steam line or main feedwater line could degrade the ability of the component cooling water (CCW) pumps of both units to perform their function. All five CCW pumps for Cook 1 & 2 are in the same room. The pumps are not qualified for the harsh environment of a HELB. Therefore, all of the pumps may fail on exposure to the high humidity and high temperatures caused by a main steam line or a main feedwater line break in the pipe chase adjoining the room.

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- A break in the high-pressure feedwater heaters or associated piping near the door to the switchgear room could degrade the ability of both trains of 600V safety-related buses. The door between the switchgear room and the turbine building is normally open and may not close in the event of a HELB. Both trains of 600V safety-related buses are in the switchgear room and the buses are not qualified for a harsh environment. Therefore, both trains of safety-related 600V buses may fail on exposure to the high humidity and high temperatures of a HELB.
- A HELB in the turbine building could degrade the ability of all three auxiliary feedwater (AFW) pumps. The door to the turbine-driven AFW pump is normally open and may not close in the event of a HELB. The two motor-driven AFW pumps are in rooms whose ventilation intake is from the turbine building. AFW pumps are not qualified for a harsh environment. Therefore, all AFW pumps may fail on exposure to the high humidity and high temperatures of a HELB in the turbine building.

### Discussion

#### Conditions conducive to a risk-significant configuration:

Four conditions must coexist to produce a risk-significant configuration like that at Cook. These four conditions are (1) lack of a HELB barrier between the redundant trains of a system that is needed to mitigate accidents, (2) the lack of environmental qualification for the redundant components of trains located in the same area, (3) the presence of high-energy piping in adjacent areas, and (4) the lack of a HELB barrier between adjacent piping and the redundant safety system trains.

#### Relationship of the risk-significant configuration to regulatory guidance:

Section 3.6.1 of the Standard Review Plan (SRP) and NRR Plant Systems Branch Technical Position SPLB 3-1 (formerly APCSB 3-1) provide regulatory guidance on the plant design for protection against postulated piping failures outside containment. When SPLB 3-1 is used as a guide to meet the requirements of the General Design Criterion 4 of 10 CFR Part 50, Appendix A, the method used to conform with that regulatory guidance depends upon when the construction permit applications were tendered and the operating licenses issued. Section B.4 of SPLB 3-1 provides details on the dependence of its applicability to the dates on which construction permits were tendered or operating licenses were issued.

Generic Letter 87-11, issued on June 11, 1987, transmitted Revision 2 of the Mechanical Engineering Branch (MEB) Technical Position MEB 3-1. This revision provided additional guidance on locations where pipe breaks should be postulated. Revision 2 of MEB 3-1 allows the elimination of pipe-whip restraints, jet-impingement shields (placed to mitigate the effects of arbitrary intermediate ruptures), and other related changes. However, the revision does not relieve licensees from the need to conform to the guidance relating to HELB effects on essential systems and components. Essential systems and components are systems and components required to shut down the reactor and mitigate the consequences of a postulated piping failure, without offsite power. Even though application of Revision 2 of the MEB 3-1 pipe break criteria may not require postulating breaks near areas that house the redundant equipment and installing pipe restraints, licensees are expected to comply with their licensing basis and regulatory commitments for postulating a crack at the location most damaging to the

essential structures and systems. For example, the Giambusso letter of 1972 (NUREG-0800, Standard Review Plan 3.16.1, Appendix B, Rev. 2, October 1999) specifies that where pipes carrying high-energy fluids are routed near structures and systems necessary for safe shutdown of the plant, supplemental protection of those structures and systems shall be provided to cope with the environmental effects (including the effects of jet-impingement) of a single postulated open crack at the location most damaging to those essential structures and systems.

NUREG-1728, "Assessment of Risk Significance Associated With Issues Identified at D. C. Cook Nuclear Power Plant," Volumes 1 & 2 were published in October 2000. This report documents the results of an analysis of the risk significance at D. C. Cook Nuclear Power Plant, Units 1 & 2 since August 1997. This NUREG may be accessed electronically at the NRC's Public Electronic Reading Room at [www.nrc.gov/NRC/ADAMS/index.html](http://www.nrc.gov/NRC/ADAMS/index.html).

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below, the appropriate regional office, or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

**/RA/**

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2000-18	Substandard Material Supplied by Chicago Bullet Proof Systems	11/29/2000	All 10 CFR Part 50 licensees and applicants. All category 1 fuel facilities. All 10 CFR Part 72 licensees and applicants
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2000-15	Recent Events Resulting in Whole Body Exposures Exceeding Regulatory Limits	9/29/2000	All radiography licensees
2000-14	Non-Vital Bus Fault Leads to Fire and Loss of Offsite Power	9/27/2000	All holders of OL for nuclear power reactors
2000-13	Review of Refueling Outage Risk	9/27/2000	All holders of OL for nuclear power reactors
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OL = Operating License  
CP = Construction Permit