United States Nuclear Regulatory Commission
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FOR IMMEDIATE RELEASE
(Tuesday, November 21, 1995)

NOTE TO EDITORS:

The Nuclear Regulatory Commission has received the attached report from its independent Advisory Committee on Reactor Safeguards. The report, in the form of a letter, provides comments on proposed modifications to emergency procedure guidelines to mitigate core instabilities in boiling water reactors.

In addition, the NRC's Executive Director for Operations received two ACRS reports. They provide comments on:

1) A proposed final Regulatory Guide l.l64, "Time Response Design Criteria for Safety-Related Operator Actions."

2) NUREG-0700, Revision 1, "Human-System Interface Design Review Guideline."

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Attachments:
As stated

November 14, 1995

The Honorable Shirley Ann Jackson
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Jackson:

SUBJECT: PROPOSED MODIFICATIONS TO THE BOILING WATER REACTOR OWNERS GROUP EMERGENCY PROCEDURE GUIDELINES TO ADDRESS REACTOR CORE INSTABILITIES

During the 426th meeting, November 2-4, 1995, the Advisory Committee on Reactor Safeguards completed its review of the proposed modifications to the Boiling Water Reactor Owners Group (BWROG) emergency procedure guidelines (EPGs) to address mitigation of reactor core instabilities. We previously considered this matter during our January and November 1994, and February 1995 meetings. Our Subcommittee on Thermal Hydraulic Phenomena met to consider this matter on May 12, 1993, and January 27 and October 31, 1995. We also had the benefit of the referenced documents.

The ACRS was requested to review BWR core power stability shortly after the March 1988 instability event that occurred at the LaSalle County Station, Unit 2. In the June 14, 1989 report on this matter, we stated that the program developed by the BWROG in conjunction with General Electric Nuclear Energy (GENE) adequately responded to the issue, provided that the reactor protection system functions on demand. We noted, however, that additional study was needed to address safety issues resulting from an anticipated transient without scram (ATWS) event that may be compounded by core power instability.

The BWROG strategy to deal with an ATWS event with core power oscillations is to change the EPGs to instruct the operator to immediately lower the vessel water level below the feedwater sparger. This measure effectively mitigates the consequences of large amplitude core power oscillations. Additionally, the BWROG has recommended that the operators be instructed to lower the vessel water level below the top of active fuel to reduce core power further while liquid boron is being injected into the lower plenum of the vessel. After the required amount of boron has been added, the water level is then to be raised to reinitiate natural circulation and remix the stratified boron mixture to shut down the plant.

The BWROG has not presented a convincing argument that the remixing of the stratified boron would occur in a timely manner. The data

presented to support its arguments were derived from 1/6-scale tests performed by GENE nearly 15 years ago, and information has been lost that could support a convincing case for rapid remixing. Moreover, the boron remixing tests were an afterthought, added to a program the primary purpose of which was to provide a more robust evaluation of boron mixing. As a result, some aspects of the facility scaling were deficient. Other relevant data obtained from BWR plant transients do not necessarily support the remixing results from the GENE 1/6-scale tests.

Moreover, calculations by the NRC staff show that maintaining the vessel water level at five feet above top of active fuel is the preferable strategy when standby liquid control (SLC) injection is available. For the lower probability case where SLC injection is unavailable, lowering the vessel water level into the core region in accordance with the BWROG strategy may have a small advantage in gaining time for the operator to take action to restore SLC injection before the suppression pool reaches its temperature limit. Based on calculations made with various computer codes, the BWROG has estimated this time increase to be on the order of 6 to 12 minutes, depending on the assumptions made about plant operating parameters. The NRC staff, however, used the TRAC-B and RAMONA codes to estimate this time increase to be from 1 to 6 minutes. We have greater confidence in the results based on the NRC codes.

Because of the very low probability of an ATWS event, the Backfit Rule precludes requiring the BWROG to revise its previously approved vessel water level control strategy. We therefore concur with the NRC staff position that allows a licensee the option of using the water level control strategy advocated by the BWROG. We strongly urge, however, that the BWR plant licensees reconsider their position in this matter.

Sincerely,

/s/

T. S. Kress
Chairman, ACRS

References:

1. Memorandum dated October 12, 1995, from R. Jones, Nuclear Regulatory Commission, to P. Boehnert, ACRS, transmitting draft SER on the Acceptance of the BWROG Emergency Procedure Guidelines Modifications to Address Reactor Core Instabilities

2. Letter dated September 15, 1995, from R. Pinelli, Chairman, BWR Owners Group, to G. Holahan, Nuclear Regulatory Commission, Subject: Request for Comment on Draft Safety Evaluation of Proposed Emergency Procedure Guidelines - Boiling Water Reactor Owners Group (BWROG) Response and attachment, General Electric Report, GE-NE-A00-05652-03

(Proprietary), "Summary of BWR Boron Mixing," dated September 1995

3. SECY-95-002, Memorandum dated January 3, 1995, from James M. Taylor, NRC Executive Director for Operations, for the Commissioners, Subject: Status of the Review of Modifications to Emergency Procedure Guidelines for Boiling Water Reactor ATWS with Power Oscillations
4. Memorandum dated November 4, 1994, from J. March-Leuba, Oak Ridge National Laboratory, to L. Phillips, Nuclear Regulatory Commission, Subject: Estimation of Density Reactivity Coefficient in the Presence of Boron
5. Letter dated January 18, 1995, from J. Dale, GE Nuclear Energy, to U. S. Nuclear Regulatory Commission, Attention P. Boehnert, ACRS, transmitting:

    - NEDC-22030, Boron Remixing Tests (partial copy) - Proprietary
    - NEDE-22267, Test Report, Three-Dimensional Boron Mixing Model (partial copy) - Proprietary
    - NEDE-22275, Evaluation of 1/6-Scale, Three-Dimensional Simulated Boron Mixing Test Results (partial copy) - Proprietary
    - Software Functional Specification for the 3-D Mixing Test DAS - Proprietary
    - BWR/5-218, 1/6-Scale RPV 3-D Model Drawings - Proprietary
    - Sample Calculation of Chemical Composition from Specific Gravity - Proprietary
    - NEDO-20748, Startup Test Program (Japanese Plant)
    - "Volatility of Sodium Pentaborate," an Abstract

6. Report dated June 14, 1989, from Forrest J. Remick, ACRS Chairman, to Lando W. Zech, Jr., NRC Chairman, Subject: Boiling Water Reactor Core Power Stability

November 14, 1995

Mr. James M. Taylor
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Taylor:

SUBJECT: PROPOSED FINAL REGULATORY GUIDE 1.164, "TIME RESPONSE DESIGN CRITERIA FOR SAFETY-RELATED OPERATOR ACTIONS," TO RESOLVE GENERIC SAFETY ISSUE B-17

During the 426th meeting of the Advisory Committee on Reactor Safeguards, November 2-4, 1995, we reviewed the proposed final Regulatory Guide 1.164, which was developed by the staff to resolve Generic Safety Issue B-17, "Criteria for Safety-Related Operator Actions." During the meeting, we had the benefit of discussions with the NRC staff. We also had the benefit of the documents referenced.

Criterion 19, "Control Room," of Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants," requires that a control room be provided from which actions can be taken to operate the nuclear power unit safely under normal and accident conditions. Generic Safety Issue B-17 called for the development of time criteria for safety-related operator actions that included a methodology for determining whether or not automatic actuation would be needed to mitigate a design-basis event.

In Regulatory Guide 1.164, the staff endorses ANSI/ANS-58.8-1994, "Time Response Design Criteria for Safety-Related Operator Actions." This Standard establishes criteria and simplifies the process for calculating the minimum allowable response times for manual operator actions to stabilize the plant during a design-basis event. The NRC staff proposes endorsement of this Standard to resolve Generic Safety Issue B-17.

Based on material presented by the staff, we find no technical basis for the estimates of minimum times for operator actions in ANSI/ANS-58.8-1994. Comparison of the recommended times with results from exercises done on plant simulators does not demonstrate that these times are appropriately conservative. Consequently, we do not support the staff's endorsement of ANSI/ANS-58.8-1994 in Regulatory Guide 1.164 and do not believe that this endorsement is the appropriate way to resolve Generic Safety Issue B-17.

The Standard does not address operator response times for advanced nuclear power plants. There is a need to consider this issue in some way for the evolutionary and passive plants.

Additional comments by ACRS Members George Apostolakis, Ivan Catton, and Robert L. Seale are presented below.

Sincerely,

/s/

T. S. Kress
Chairman, ACRS

Additional Comments by ACRS Members George Apostolakis, Ivan Catton, and Robert L. Seale

In support of its recommended minimum response times, the staff relied in part on results that were produced from the Operator Reliability Experiments. We find this to be inappropriate because these experiments were not subjected to independent peer review and the staff did not have access to the actual data collected.

References:

1. Memorandum dated October 4, 1995, from M. Wayne Hodges, Office of Nuclear Regulatory Research, to John T. Larkins, ACRS, Subject: Regulatory Guide 1.164, "Time Response Design Criteria for Safety-Related Operator Actions," for ACRS Review and also transmitting staff response to public comments
2. U. S. Nuclear Regulatory Commission, NUREG-0933, Supplement 06, March 1987, "A Prioritization of Generic Safety Issues," Item B-17, "Criteria for Safety-Related Operator Actions," Revision 2
3. American Nuclear Society, ANSI/ANS-58.8-1994, "Time Response Design Criteria for Safety-Related Operator Actions," approved by the American National Standards Institute, Inc., August 23, 1994

November 13, 1995

Mr. James M. Taylor
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Taylor:

SUBJECT: NUREG-0700, REVISION 1, "HUMAN-SYSTEM INTERFACE DESIGN REVIEW GUIDELINE"

During the 426th meeting of the Advisory Committee on Reactor Safeguards, November 2-4, 1995, we heard presentations by and held discussions with the NRC staff concerning the subject Design Review Guideline. We also had the benefit of the document referenced.

An outgrowth of the Three Mile Island accident was an NRC requirement that all licensees and applicants for commercial nuclear power plant operating licenses conduct detailed control room design reviews, including reviews of remote shutdown panels, to identify and correct design deficiencies related to human factors. Extensive guidelines published as NUREG-0700, "Guidelines for Control Room Design Reviews," were prepared to support these reviews.

The introduction of computer-based, human-system interface (HSI) technology into nuclear power plants prompted the development of Revision 1 to NUREG-0700. The objective of this document is to provide guidance to the NRC staff for HSI reviews of design submittals or as part of an inspection or other type of regulatory review.

The staff has developed technically defensible principles in Part 1 and a set of guidelines for HSI design reviews in Part 2. However, we are concerned that the detailed HSI design review guidance in Part 2 may discourage the approval of other, equally acceptable alternatives. Furthermore, we are concerned that the guidelines in Part 2 will become de facto regulations.

We plan to continue our review of the overall human factors program.

Sincerely,

/s/

T. S. Kress
Chairman, ACRS

Reference:
U. S. Nuclear Regulatory Commission, NUREG-0700, Revision 1, "Human-System Interface Design Review Guideline," dated January 1995