United States Nuclear Regulatory Commission
Office of Public Affairs
Washington, DC 20555
Phone 301-415-8200 Fax 301-415-2234
Internet:opa@nrc.gov

No. 95-130 FOR IMMEDIATE RELEASE
Tel. 301/415-8200 (Wednesday, October 18, 1995)

NOTE TO EDITORS:

The Nuclear Regulatory Commission has received the two attached reports from its independent Advisory Committee on Reactor Safeguards. The reports, in the form of letters, comment on:

1) A National Academy of Sciences/National Research Council study on safety and reliability issues in the use of digital instrumentation and control systems in nuclear power plants.

2) An action plan developed to help resolve Generic Issue 166, "Adequacy of Fatigue Life of Metal Components."

In addition, the NRC's Executive Director for Operations received an ACRS report, also attached, that comments on a proposed final revision 1 to Regulatory Guide l.l52, "Criteria for Digital Computers in Safety Systems of Nuclear Power Plants."

#

Attachments:
As stated

October 13, 1995

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

Dear Chairman Jackson:

SUBJECT: NATIONAL ACADEMY OF SCIENCES/NATIONAL RESEARCH COUNCIL STUDY ON "DIGITAL INSTRUMENTATION AND CONTROL SYSTEMS IN NUCLEAR POWER PLANTS, SAFETY AND RELIABILITY ISSUES" - PHASE 1

During the 425th meeting of the Advisory Committee on Reactor Safeguards, October 5-7, 1995, we reviewed the National Academy of Sciences/National Research Council (NAS/NRC) Phase 1 report on Digital Instrumentation and Control Systems in Nuclear Power Plants, Safety and Reliability Issues. The NAS/NRC Committee Chairman described the results of the Phase 1 report. We also had the benefit of the documents referenced.

The objective of the Phase 1 study was to define the important safety and reliability issues concerning hardware, software, and human-machine interfaces that arise from the use of digital instrumentation and control technology in nuclear power plant operations. The report identifies eight key issues: six technical and two strategic. It notes that these issues are common to other industries where software is required for dependable operation of systems. The report succinctly presents the issues that the NAS/NRC Committee found to be important.

We agree that the issues identified in the Phase 1 report will be important considerations as digital technology is used more extensively in nuclear power plants. In the past, we have called attention to the effects of environmental stressors. The NAS/NRC Chairman stated that the NAS/NRC Committee considered, but decided not to raise this issue to the level of a "key technical issue." We continue to believe this is an important issue that the staff must address as it develops its regulatory guidance for digital systems. However, this is part of the broader issue of environmental qualification of safety-related equipment and does not need to be a key issue of the Phase 2 study.

We have concerns regarding a potential conflict between the Phase 2 completion schedule and the staff's schedule for issuing the

Standard Review Plan (SRP) and associated regulatory guides. We believe it is important that the SRP and other regulatory guidance benefit from the insights in the Phase 2 report.

Sincerely,

/s/

T. S. Kress
Chairman

References:

1. Report dated 1995, from the Committee on Application of Digital Instrumentation and Control Systems to Nuclear Power Plant Operations and Safety, Board on Energy and Environmental Systems, Commission on Engineering and Technical Systems, National Research Council, Subject: Digital Instrumentation and Control Systems in Nuclear Power Plants, Safety and Reliability Issues - Phase 1
2. Memorandum dated December 2, 1993, from Ivan Selin, Chairman, NRC, to NRC Commissioners, Subject: Computers in Nuclear Power Plant Operations
3. Letter dated July 14, 1994, from T. S. Kress, Chairman, ACRS, to Ivan Selin, Chairman, NRC, Subject: Proposed National Academy of Sciences/National Research Council Study and Workshop on Digital Instrumentation and Control Systems
4. Letter dated August 23, 1994, from Ivan Selin, Chairman, NRC, to T. S. Kress, Chairman, ACRS, regarding ACRS letter of July 14, 1994 on National Academy of Sciences/National Research Council Proposal for a Study and Workshop on the "Application of Digital Instrumentation and Control Technology to Nuclear Power Plant Operations and Safety"

October 16, 1995

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

Dear Chairman Jackson:

SUBJECT: FATIGUE ACTION PLAN

During the 425th meeting of the Advisory Committee on Reactor Safeguards, October 5-7, 1995, we completed our deliberations on the Fatigue Action Plan that we started during our 424th meeting, September 7-8, 1995. We had the benefit of discussions with representatives of the NRC staff regarding this matter and of the documents referenced.

The Fatigue Action Plan was developed to help resolve Generic Issue 166, "Adequacy of Fatigue Life of Metal Components." It was intended to address three specific issues: (1) the margin against fatigue failure of older nuclear power plants with reactor coolant pressure boundary components designed to ANSI B31.1 requirements rather than the newer ASME Code Section III, Class 1 fatigue requirements; (2) the effects of reactor coolant environments on fatigue life; and (3) the appropriate staff actions when components have cumulative usage factors (CUFs) greater than 1.

The work done on the Fatigue Action Plan by the staff and the additional work supported by the Department of Energy and the Electric Power Research Institute have shown that, even after including environmental effects, the CUFs for almost all reactor components which were originally designed to ASME Code fatigue requirements will still be less than 1. It also showed that the nuclear piping, which had been designed to the ANSI B31.1 requirements, in general has margins against fatigue failure comparable to those achieved by using the ASME Section III, Class 1, fatigue requirements. Although fatigue failures have been experienced in nuclear plants, these failures have been due to unanticipated loads and not to inadequate design margins for the anticipated cyclic loads.

Based on a probabilistic parametric study, the staff concluded that even if fatigue cracks were initiated, rupture of reactor coolant piping as a result of fatigue crack growth would be a low-probability event. We anticipate commenting on this parametric study at a later time.

The summary of the Fatigue Action Plan provides only general guidance for the appropriate actions to be taken when the CUF is greater than 1. However, the supporting documentation suggests that the proposed nonmandatory appendix to Section XI of the ASME Code provides evaluation methods which may be acceptable to the staff. These methods provide a choice of either the traditional CUF approach or a "flaw-tolerance" approach similar to that widely used in the aerospace industry. We agree that these types of evaluations would be appropriate.

We agree with the staff that maintaining the integrity of the reactor coolant pressure boundary is an important element in defense–in–depth, and that fatigue is a potentially significant mechanism which can degrade the integrity of the pressure boundary. But, on the basis of the work done by the staff and industry, no immediate staff or licensee action is needed.

Dr. William Shack did not participate in the Committee's deliberations regarding this matter.

Sincerely,

/s/

T. S. Kress
Chairman

References:

1. Draft Commission Paper, received August 30, 1995, from James M. Taylor, Executive Director for Operations, NRC, to the Commissioners, Subject: Completion of the Fatigue Action Plan (Predecisional)
2. U. S. Nuclear Regulatory Commission, NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," published March 1995
3. SECY-94-191 dated July 26, 1994, from James M. Taylor, Executive Director for Operations, NRC, to the Commissioners, Subject: Fatigue Design of Metal Components
4. Staff Requirements Memorandum dated May 21, 1993, from Samuel Chilk, Secretary of NRC, to John T. Larkins, Executive Director, ACRS, Subject: Periodic Meeting with the Advisory Committee on Reactor Safeguards, Friday May 14, 1993
5. Letter dated August 17, 1992, from David A. Ward, Chairman, ACRS, to James M. Taylor, Executive Director for Operations, NRC, Subject: Related Branch Technical Position On Fatigue Evaluation Procedures

October 13, 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 REVISION 1 TO REGULATORY GUIDE 1.152, "CRITERIA FOR DIGITAL COMPUTERS IN SAFETY SYSTEMS OF NUCLEAR POWER PLANTS"

During the 425th meeting of the Advisory Committee on Reactor Safeguards, October 5-7, 1995, we reviewed the proposed final Revision 1 to Regulatory Guide 1.152. The revised Regulatory Guide endorses IEEE Standard Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations (IEEE Standard 7-4.3.2-1993), "with the exception of quantitative reliability goals (Section 5.15)." During this meeting, we had the benefit of discussions with the NRC staff. We also had the benefit of the documents referenced.

Based on our review, we concur with the Regulatory Position of Revision 1 to Regulatory Guide 1.152. However, we offer the following comment.

In the proposed Regulatory Guide, the staff declines to endorse the use of quantitative reliability goals as the sole means of meeting the Commission regulations for reliability of digital computers in safety systems. This position is consistent with our previously expressed views as provided in our report of March 18, 1993 to Chairman Selin. The language used in the staff response to Public Comment 1 on this issue provides a clearer expression of the staff position on quantitative reliability goals than does the language used in the Regulatory Guide. During our discussion, the staff agreed to modify the language in the Regulatory Guide to be consistent with its response to the public comment.

Subject to the staff's planned modification, we have no objection to the issuance of Regulatory Guide 1.152, Revision 1.

Additional comments by ACRS Members George Apostolakis, Ivan Catton, Mario H. Fontana, William J. Lindblad, and Charles J. Wylie are presented below.

Sincerely,

/s/

T. S. Kress
Chairman

Additional Comments by ACRS Members George Apostolakis, Ivan Catton, Mario H. Fontana, William J. Lindblad, and Charles J. Wylie

We believe that in taking exception to IEEE 7-4.3.2-1993, Section 5.15, the staff is tilting at windmills. We would endorse the Standard in its entirety. The staff could make its point regarding the adequacy of quantitative reliability goals for software without taking exception to this Section.

References:

1. Regulatory Guide 1.152, Revision 1, dated September 1995, "Criteria for Digital Computers in Safety Systems of Nuclear Power Plants," transmitted by memorandum dated September 1, 1995, from David L. Morrison, NRC Office of Nuclear Regulatory Research, to John T. Larkins, ACRS
2. Institute of Electrical and Electronics Engineers, Standard 7-4.3.2-1993, "Criteria for Digital Computers in Safety Systems of Nuclear Power Generating Stations," September 15, 1993
3. Letter dated July 31, 1995, from C. L. Terry, Group Vice President, Nuclear, TUELECTRIC, to U.S. NRC, Subject: TU Electric Comments on Draft Regulatory Guide DG-1039, "Criteria for Digital Computers in Safety Systems of Nuclear Power Plants"
4. Report dated March 18, 1993, from Paul Shewmon, Chairman, ACRS, to Ivan Selin, Chairman, NRC, Subject: Computers in Nuclear Power Plant Operations