ACRSR-1850

September 15, 1999

Dr. William D. Travers
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Dr. Travers:

SUBJECT: SAFETY EVALUATION REPORT RELATED TO ELECTRIC POWER RESEARCH INSTITUTE RISK-INFORMED METHODS TO INSERVICE INSPECTION OF PIPING (EPRI TR-112657, REVISION B, JULY 1999)

During the 465th meeting of the Advisory Committee on Reactor Safeguards, September 1-3, 1999, we met with representatives of the NRC staff, Electric Power Research Institute (EPRI), and Nuclear Energy Institute to discuss the staff's Safety Evaluation Report (SER) on the topical report (EPRI TR-112657, Revision B) regarding application of EPRI risk-informed methods to inservice inspection (ISI) of piping. Our Subcommittees on Materials and Metallurgy and on Reliability and Probabilistic Risk Assessment met on May 5, 1999, to discuss this matter. We also had the benefit of the documents referenced.

<u>Conclusions</u>

1. We agree with the staff's conclusion that the methodology described in EPRI TR-112657, Revision B, can be used to develop risk-informed ISI programs that will provide an acceptable alternative to the requirements of paragraphs (a)(3) and (g) of 10 CFR 50.55a and is consistent with the guidance in Regulatory Guides 1.174 (General Guidance) and 1.178 (ISI). The EPRI methodology is also consistent with the requirements of American Society of Mechanical Engineers (ASME) Code Cases N-560 (Class 1 piping systems) and N-578 (Class 1, 2, and 3 piping systems).

2. The EPRI methods will better focus inspections on piping with active degradation mechanisms and relatively high risk significance than the current ASME Section XI ISI programs and will lead to significant reductions in occupational radiation exposure to personnel and associated inspection costs. In almost all cases, use

of EPRI methods will also result in a reduction in risk. In those cases in which some increase in risk could occur, we believe it will be very small and well within the guidelines in Regulatory Guide 1.174.

3. Although the Westinghouse Owners Group (WOG) and EPRI risk-informed ISI methods will result in significant improvements in piping inspection programs, it may be possible to further reduce the number and frequency of inspections in the future with little or no increase in risk. Inspections are prioritized by relative risk ranking regardless of the absolute level of the risk involved which, in most cases, is very small. Consequently, excessive inspection resources may still be expended on systems like PWR primary piping which has no known active modes of degradation. In many cases, it can be shown that PWR primary piping has leak-before-break behavior. In contrast, fewer inspection resources are devoted currently to systems with less relative risk importance but with active modes of degradation such as flow-assisted corrosion or thermal fatigue and a much higher probability of failure.

<u>Discussion</u>

Although piping constitutes a significant portion of the reactor coolant system boundary, because of its robust design and the protection afforded by other engineered safety systems, piping failures generally make relatively small contributions to core damage frequency (CDF) or large, early release frequency (LERF). Therefore, even "perfect" piping ISI programs would lead to only small risk reductions.

Some ACRS members believe that, because of the low risk significance associated with piping failures, the current approach to risk-informed ISI as expressed in the EPRI and WOG methods and the current ASME Code Cases is overly timid and that it would be appropriate to make more drastic changes in ISI programs. The number and frequency of inspections could be further reduced without having a significant impact on risk. Instead of prioritizing ISI in terms of relative risk and frequency of failure, the inspections could be prioritized to reduce the total number of piping failures and forego the attempts to distinguish between piping segments virtually all of which have low risk significance. This could, for example, lead to a reduction of inspection resources expended on systems like PWR primary piping which has no known active modes of degradation. In many cases, it can be shown that PWR primary piping exhibits leak-before-break behavior. On the other hand, fewer inspection resources are devoted to systems with less relative risk importance but with active modes of degradation such as flow-assisted corrosion or thermal fatigue and a much higher (several orders of magnitude) probability of failure.

Other ACRS members believe that it is prudent to retain relative risk significance as an important element in design of the ISI program, and that the EPRI and WOG methods for the development and implementation of risk-informed ISI programs are reasonable.

Continued refinement of risk-informed ISI programs is possible so that, for example, the augmented inspection requirements which are currently excluded from both programs could be included in a single integrated program. We believe, however, that such activities should not impede the timely implementation of programs resulting from the use of EPRI and WOG methods by licensees.

Sincerely,

/s/

Dana A. Powers
Chairman

References

1. Memorandum dated August 12, 1999, from William H. Bateman and Richard J. Barrett, Office of Nuclear Reactor Regulation, to John T. Larkins, Executive Director, Advisory Committee on Reactor Safeguards, Subject: Safety Evaluation Report Related to EPRI Risk-Informed Inservice Inspection Evaluation Procedure (EPRI TR-112657, Revision B, July 1999).
2. Electric Power Research Institute, EPRI TR-112657, Revision B, WO3230, Final Report, “Revised Risk-Informed Inservice Inspection Evaluation Procedure,” July 1999.
3. Letter dated July 13, 1999, from Jeff Mitman, Electric Power Research Institute, to Mike Markley, Advisory Committee on Reactor Safeguards, Subject: EPRI Risk-Informed In-Service Inspection Procedure Discussion.
4. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” July 1998.
5. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.178, “An Approach for Plant-Specific Risk-Informed Decisionmaking Inservice Inspection of Piping,” issued for trial use September 1998.
6. American Society of Mechanical Engineers, “Case N-560, Alternative Examination Requirements for Class 1, B-J Piping Welds, Section XI, Division 1,” August 9, 1996.
7. American Society of Mechanical Engineers, “Case N-578, Risk Informed Requirements for Class 1, 2, and 3 Piping, Method B, Section XI, Division 1,” September 2, 1997.

8. Westinghouse Energy Systems, WCAP-14572, Revision 1, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," October 1997.
9. Westinghouse Energy Systems, WCAP-14572, Revision 1, Supplement 1, "Westinghouse Structural Reliability and Risk Assessment (SRRA) Model for Piping Risk-Informed Inservice Inspection," October 1997.