UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

January 18, 2000

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

Dear Chairman Meserve:

SUBJECT: SUMMARY REPORT - FOUR HUNDRED SIXTY-EIGHTH MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, DECEMBER 2-4, 1999, AND OTHER RELATED ACTIVITIES OF THE COMMITTEE

During its 468th meeting, December 2-4, 1999, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters, completed two reports and letters, and authorized Dr. John T. Larkins, Executive Director of the ACRS, to transmit the memoranda, as noted below:

REPORTS

- Draft Commission Paper Regarding the 120-Month Update Requirement for Inservice Inspection and Inservice Testing Programs (Report to Richard A. Meserve, Chairman, NRC, from Dana A. Powers, Chairman, ACRS, dated December 8, 1999)

- Report on the Safety Aspects of the License Renewal Application for Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (Report to Richard A. Meserve, Chairman, NRC, from Dana A. Powers, Chairman, ACRS, dated December 10, 1999)

LETTERS

- Proposed Resolution of Generic Safety Issue 190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life" (Letter to William D. Travers, Executive Director for Operations, NRC, from Dana A. Powers, Chairman, ACRS, dated December 10, 1999)

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- NUREG-1624, Revision 1, "Technical Basis and Implementation Guidelines for a Technique for Human Event Analysis (ATHEANA)" (Letter to William D. Travers, Executive Director for Operations, NRC, from Dana A. Powers, Chairman, ACRS, dated December 15, 1999)

MEMORANDA

- Proposed Final Amendment to 10 CFR 50.47, "Emergency Plans," Relating to a Reevaluation of Policy on the Use of Potassium Iodide (KI) for the General Public After a Severe Accident at a Nuclear Power Plant (Memorandum to William D. Travers, Executive Director for Operations, NRC, from John T. Larkins, Executive Director, ACRS, dated December 7, 1999)

- NRC/Industry Collaborative Project to Support Resolution of Waterhammer Issues Pursuant to Generic Letter 96-06 (Memorandum to John N. Hannon, NRR, from Howard J. Larson, Acting Associate Director for Technical Support, ACRS/ACNW, dated December 22, 1999)

HIGHLIGHTS OF KEY ISSUES CONSIDERED BY THE COMMITTEE

1. Proposed Final Amendment to 10 CFR 50.55a Regarding Elimination of the 120-Month ISI and IST Programs Update Requirement

   The Committee heard presentations by and held discussions with representatives of the NRC staff, the American Society of Mechanical Engineers (ASME), and the Nuclear Energy Institute (NEI) concerning the proposed final amendment to 10 CFR 50.55a "Codes and Standards."

   The NRC staff issued a proposed rule on April 27, 1999, to solicit public comments on a proposal to eliminate the requirement that licensees update their inservice inspection (ISI) and inservice testing (IST) programs every 120 months to the most recent edition of the ASME Code incorporated by reference in 10 CFR 50.55a. In a letter dated April 19, 1999, the ACRS recommended retaining the requirement.

   In a staff requirements memorandum dated June 24, 1999, the Commission directed the staff to evaluate the public comments and develop options and recommendations on the retention or elimination of the update requirement.

   The staff has developed three options. Option 1 is to eliminate the update requirement, define baseline ISI and IST requirements, and allow voluntary updating to more recent editions of the ASME Code. Option 2 is to retain the

120-month update requirement. Option 3 is to develop criteria for the authorization of plant-specific alternatives to the 120-month update requirement.

Conclusion

The Committee sent a report on this matter to Chairman Meserve, dated December 8, 1999.

2. Low-Power and Shutdown Operations Risk Insights Report

The Committee heard presentations by and held discussions with representatives of the NRC staff concerning a draft low-power and shutdown (LPSD) risk insights report (draft NUREG) titled, "Low-Power and Shutdown Risk, A Perspectives Report." The Committee also discussed the staff's plans for completing an associated draft Commission paper on this matter. The Committee considered the staff's approach for incorporating LPSD risk insights in the context of risk-informed regulation; the significance of LPSD risk in terms of initiating events, operational states, and human actions that contribute to and mitigate risk; current methods and tools for analyzing risk; and plant-specific probabilistic risk assessment (PRA) and qualitative non-PRA approaches. The Committee considered the staff's recommendations to build on existing LPSD work, to continue development of guidance such as the proposed ASME Standard for PRA quality, and to enhance methods for human analysis and screening of plant operational states.

Conclusion

The Committee decided to continue its review of this matter during future meetings when the revised insight reports and proposed Commission paper are made available to the ACRS.

3. License Renewal Application for Calvert Cliffs Nuclear Power Plant and the Associated Safety Evaluation Report

The Committee heard presentations by and held discussions with representatives of the NRC staff and the Baltimore Gas and Electric Company (BGE) regarding the license renewal application for Calvert Cliffs Units 1 and 2, and the associated Safety Evaluation Report. BGE provided an overview of its programs for life cycle management, one-time inspection, and commitment management. The staff identified the need for additional guidance concerning complying with the proposed amendment to 10 CFR 50.59, "Changes, tests and experiments."

The members, staff, and BGE discussed the component that would limit continued plant operation, the process by which the staff will be informed of the results of one-time inspections, and the adequacy of the 10-year frequency of ASME Code inspections during the period of extended operation.

Conclusion

The Committee sent a report on this matter to Chairman Meserve, dated December 10, 1999.

4. Proposed Resolution of Generic Safety Issue-190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life"

The Committee heard presentations by and held discussions with representatives of the NRC staff concerning the proposed resolution of Generic Safety Issue (GSI)-190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life."

The staff stated that the effects of fatigue for 40-year initial reactor license period were studied and resolved under GSI-78, "Monitoring of Fatigue Transient Limits for Reactor Coolant System," and GSI-166, "Adequacy of Fatigue Life of Metal Components." GSI-190 was established to address the residual concern of GSI-78 and GSI-166 regarding the environmental effects of fatigue on pressure boundary components for 60 years of plant operation.

With the technical assistance from Pacific Northwest National Laboratory (PNNL), the staff conducted a study to resolve this GSI; this study examined design-basis fatigue transients and the probability of fatigue failure of selected metal components for 60-year plant life and the resulting effect on core damage frequency (CDF).

The following major findings were determined from the PNNL study:

- Many of the components have cumulative probabilities of crack initiation and cumulative probabilities of through-wall cracks that approach unity within the 40- to 60-year time period. However, other components, often with similar values of fatigue usage factors, show much lower failure probabilities. This is a consequence of the statistical nature of forecasting fatigue crack initiation through use of the cumulative usage factor (CUF).

- The maximum failure rate (through-wall cracks) is in the range of 10^{-2} per year, and those failures were associated with high CUF locations.

- Failure rates for other components having much lower failure probabilities are changed by as much as an order of magnitude from 40 to 60 years, but these components make relatively small overall contributions to the CDF estimates.

- The maximum CDF based on these calculated failure rates is about 10^{-6} per year. These maximum values correspond to components with very high cumulative failure probabilities, and the failure rates do not change much from 40- to 60- years. Calculated values of CDF were 10^{-6} per year and lower.

Considering these low CDFs, the staff concluded that they could not be used as a basis for a cost-benefit backfit analysis to justify imposition of a new regulatory requirement on operating reactors. Therefore, the staff proposed to resolve GSI-190 without recommending any additional new requirements.

Conclusion

The Committee sent a letter on this matter to the Executive Director for Operations, dated December 10, 1999.

5. A Technique for Human Event Analysis (ATHEANA)

The Committee heard presentations by and held discussions with representatives of the NRC staff concerning NUREG-1624, Revision 1, "Technical Basis and Implementation Guidelines for A Technique for Human Event Analysis (ATHEANA)." The objective of ATHEANA is to develop a methodology that allows a realistic qualitative analysis of potential accident sequences and past incidents involving human actions and a realistic evaluation of the probabilities of unsafe human actions for inclusion in PRAs.

The Committee expressed concern about the inordinate complexity of searching for error-forcing contexts in the current ATHEANA methodology, the lack of examples of how ATHEANA in superior to existing analytical techniques, and the lack of a method for quantitative analysis of potential accident sequences and past incidents involving human actions.

Conclusion

The Committee sent a letter on this matter to the Executive Director Operations, dated December 15, 1999.

6. Subcommittee Report

Dr. G. Wallis, Chairman, Thermal-Hydraulic Phenomena Subcommittee, provided a report to the Committee on the results of the November 11, 1999, Subcommittee meeting. The meeting was held to continue review of the NRC staff's program to develop code review guideline documents (i.e., regulatory guide and standard review plan section), and to discuss the collaborative project involving the NRC, the Electric Power Research Institute (EPRI), and various utilities to address resolution of waterhammer issues pursuant to NRC Generic Letter (GL) 96-06. This GL dealt with potential waterhammers in cooling water systems of containment air coolers. The results of this project have been documented in an interim EPRI report, "Resolution of Generic Letter 96-06 Waterhammer Issues." Regarding the staff's guidelines for reviewing codes, the Subcommittee discussed the draft regulatory guide and SRP Section. The Subcommittee will continue its review of this matter during a future meeting. Pursuant to the collaborative project on waterhammer, the Subcommittee identified significant shortcomings in this work. On the basis of the Subcommittee's recommendation, the Committee authorized transmittal of written comments detailing concerns identified by the Subcommittee to the NRC staff for its consideration.

Conclusion

A memorandum, dated December 22, 1999, was issued to transmit the concerns raised by the Thermal-Hydraulic Phenomena Subcommittee to the NRC staff.

7. NRC Safety Research Program Report to the Commission

The Committee continued to discuss a preliminary draft of the ACRS/Year 2000 report to the Commission on the NRC Safety Research Program.

Conclusion

The Committee plans to discuss a proposed final version of the report at the February 3-5, 2000, ACRS meeting.

8. Election of Officers for CY 2000

The Committee elected Dr. Dana A. Powers as Chairman and Dr. George Apostolakis as Vice-Chairman of the ACRS, and Dr. Mario V. Bonaca as Member-at-Large for the Planning and Procedures Subcommittee.

RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS

- The Committee discussed the response from the Executive Director for Operations (EDO), dated November 8, 1999, to ACRS comments and recommendations in its letter dated October 8, 1999, concerning the proposed resolution of Generic Safety Issue 23, "Reactor Coolant Pump Seal Failure."

  The Committee decided it was satisfied with the EDO's response.

- The Committee discussed the response from the EDO, dated November 16, 1999, to ACRS comments and recommendations in its letters dated May 19, September 17, and October 8, 1999, concerning the proposed modifications to the post-accident sampling systems for Westinghouse and Combustion Engineering Owners Groups' plants.

  The Committee decided that it was satisfied with the EDO's response.

- The Committee discussed the response from the EDO, dated November 15, 1999, to the ACRS comments and recommendations in the ACRS report, dated October 8, 1999, concerning a draft Commission paper regarding proposed guidelines for applying risk-informed decisionmaking in license amendment reviews.

  The Committee decided that it was satisfied with the EDO's response.

- The Committee discussed the response from the EDO, dated November 10, 1999, to ACRS comments and recommendations in the ACRS report, dated September 15, 1999, concerning the safety evaluation report related to EPRI risk-informed methods for inservice inspection of piping (EPRI TR-112657, Revision B, July 1999).

  The Committee decided that it was satisfied with the EDO's response.

- The Committee discussed the response from the EDO, dated November 8, 1999, to ACRS comments and recommendations in the ACRS report, dated October 12, 1999, concerning proposed plans for developing risk-informed revisions to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

  The Committee decided to continue its review of this matter during future meetings.

- The Committee discussed the response from the EDO, dated November 8, 1999, to ACRS comments and recommendations in the ACRS letter dated October 8, 1999, concerning proposed resolution of GSI B-55, "Improved Reliability of Target Rock Safety Relief Valves."

  The Committee decided it was satisfied with the EDO's response.

OTHER RELATED ACTIVITIES OF THE COMMITTEE

During the period from November 4 through December 1, 1999, the following Subcommittee meetings were held:

- Thermal Hydraulic Phenomena - November 17, 1999

  The Subcommittee reviewed the industry effort coordinated by the Electric Power Research Institute to address the issue of waterhammer in low-pressure fluid systems, pursuant to resolution of Generic Letter 96-06, and the NRC code review guideline documents (draft regulatory guide and standard review plan section).

- Reliability and Probabilistic Risk Assessment - November 18, 1999

  The Subcommittee discussed the draft low-power and shutdown (LPSD) risk insights report (draft NUREG) titled, "Low-Power and Shutdown Risk, A Perspectives Report." The Committee also discussed staff plans for completion of an associated draft Commission paper on this matter.

- Plant License Renewal - November 18, 1999

  The Subcommittee reviewed the staff's resolution of the open and confirmatory items identified in the safety evaluation report related to the license renewal of Calvert Cliffs Nuclear Power Plant Units 1 and 2 and related license renewal activities.

- Human Factors - November 19, 1999

  The Subcommittee reviewed a proposed revision to NUREG-1624, "Technical Basis and Implementation Guidelines for a Technique for Human Event Analysis (ATHEANA)," pilot application of ATHEANA to assess fire risk, and other related issues.

- Safety Research Program - December 1, 1999

  The Subcommittee discussed the final draft of the Year 2000 ACRS report to the Commission on the NRC Safety Research Program.

- Materials and Metallurgy - December 1, 1999

  The Subcommittee reviewed the three options proposed by the NRC staff concerning the proposed final amendment to 10 CFR 50.55a, "Codes and Standards." The Subcommittee also discussed this matter with representatives of the ASME, and the Nuclear Energy Institute.

- Planning and Procedures - December 1, 1999

  The Planning and Procedures Subcommittee discussed proposed ACRS activities, practices, and procedures for conducting Committee business and organizational and personnel matters relating to ACRS and its staff.

FOLLOW-UP MATTERS FOR THE EXECUTIVE DIRECTOR FOR OPERATIONS

- The Committee decided to continue its review of the draft low-power and shutdown (LPSD) risk insights report (draft NUREG) entitled, "Low-Power and Shutdown Risk, A Perspectives Report," and the associated draft Commission paper, when they become available.

- The Committee plans to continue its review of risk-informed revisions to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," during future meetings.

- The Committee plans to work with the staff in the development of the screening process and the application of ATHEANA to several realistic accident scenarios.

PROPOSED SCHEDULE FOR THE 469th ACRS MEETING

The Committee agreed to consider the following matters during the 469th ACRS Meeting, February 3-5, 2000:

Technical Aspects Associated with the Revised Reactor Oversight Process and Related Matters
Briefing by and discussions with representatives of the NRC staff regarding the technical aspects associated with the revised reactor oversight process, including the

updated significance determination process, technical adequacy of the current and proposed plant performance indicators.

Proposed Final Amendment to 10 CFR 50.72 and 50.73
Briefing by and discussions with representatives of the NRC staff and the Nuclear Energy Institute (NEI) regarding the proposed final amendment to 10 CFR 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors," and 50.73, "Licensee Event Report System."

Proposed Regulatory Guide and Associated NEI Document 96-07, "Guidelines for 10 CFR 50.59 Safety Evaluations"
Briefing by and discussions with representatives of the NRC staff and NEI regarding the status of development of proposed Regulatory Guide, which endorses guidance in NEI 96-07 associated with the implementation of the revised 10 CFR 50.59 process.

Proposed Revision of the Commission's Safety Goal Policy Statement for Reactors
Briefing by and discussions with representatives of the NRC staff regarding proposed revision of the Commission's Safety Goal Policy Statement for reactors and related matters, including industry views.

Impediments to the Increased Use of Risk-Informed Regulation and Use of Importance Measures in Risk-Informing 10 CFR Part 50
Briefing by and discussions with representatives of NEI as well as invited experts regarding impediments associated with the increased use of risk-informed regulation and use of importance measures in risk-informing 10 CFR Part 50.

Proposed Final Revision of Appendix K to 10 CFR Part 50
Briefing by and discussion with representatives of the NRC staff regarding the proposed final revision of Appendix K, "ECCS Evaluation Models," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

Response to Questions posed by Individual Commissioners Following the ACRS Meeting with the Commission on November 4, 1999.

Annual ACRS Report to the Commission on the NRC Safety Research Program.

Sincerely,

Dana A. Powers

Dana A. Powers
Chairman