



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001

SL-0555

October 25, 2007

The Honorable Dale E. Klein  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Dear Chairman Klein:

SUBJECT: SUMMARY REPORT – 546<sup>th</sup> MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, OCTOBER 4-5, 2007, AND OTHER RELATED ACTIVITIES OF THE COMMITTEE

During its 546<sup>th</sup> meeting, October 4-5, 2007, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters and completed the following report, letters, and memorandum:

REPORT:

Report to Dale E. Klein, Chairman, NRC, from William J. Shack, Chairman, ACRS:

- Digital Instrumentation and Control Systems Project Plan and Interim Staff Guidance, dated October 16, 2007.

LETTERS:

Letters to Luis A. Reyes, Executive Director for Operations, NRC, from William J. Shack, Chairman, ACRS:

- Draft Final Generic Letter 2007-XX, "Managing Gas Intrusion in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems, dated October 19, 2007.
- NRC Staff's Safety Assessment of the Industry Study Related to Dissimilar Metal Weld Issues in Pressurizer Nozzles, dated October 19, 2007.

Letter to Brian Sheron, Director, Office of Nuclear Regulatory Research, NRC, from William J. Shack, Chairman, ACRS:

- ACRS Assessment of the Quality of Selected NRC Research Projects - FY 2007, dated October 19, 2007.

MEMORANDUM:

Memorandum to Luis A. Reyes, Executive Director for Operations, NRC, from Frank P. Gillespie, Executive Director, ACRS:

- Proposed Revision to Regulatory Guide 1.100, "Seismic Qualification of Electric and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," (DG-1175), dated October 10, 2007.

HIGHLIGHTS OF KEY ISSUES

1. Digital Instrumentation and Control Systems Project Plan and Interim Staff Guidance

The Committee met with representatives of the NRC staff and the Nuclear Energy Institute (NEI) to discuss the Digital Instrumentation and Control (I&C) Systems Project Plan and Interim Staff Guidance (ISG) issued by the NRC staff to address the issues of diversity and defense-in-depth, communications, and human factors.

The staff also discussed its followup activities to address the ACRS recommendations on evaluation of operating experience and inventory and classification system for digital failure modes.

One critical issue discussed was related to the diversity and defense-in-depth ISG regarding the acceptability of manual actions to address the need for diversity. The ISG states that when protective action is required in less than 30 minutes, the installation of an independent and diverse automated backup system is an acceptable approach. When protective action is not required for at least 30 minutes, the ISG identifies manual actions as acceptable. The industry stated that each case where manual actions are to be credited should be evaluated on its own merits. A process is needed to determine, on a case-by-case basis, whether an automated backup system should be installed or manual actions could be credited.

The diversity and defense-in-depth ISG also states that potential spurious trips and actuations are of a lesser safety concern than failures to trip or actuate. This assertion may not be justified for spurious signals that automatically reconfigure systems or initiate unintended functions during the progression of a plant transient or accident, and may cause unanticipated conditions that require operator intervention to restore the required safety functions.

Representatives of NEI addressed key issues and remaining challenges related to diversity and defense-in-depth, operating experience, communications, human factors, and cyber security.

Committee Action

The Committee issued a report to the NRC Chairman on this matter, dated October 16, 2007. The Committee stated that it was encouraged by the progress and the degree of collaboration between the staff and the industry in addressing the many challenging issues, and concluded that the staff's interim guidance reports on diversity and defense-in-depth, communications, and human factors, contain appropriate guidance to support the review of near-term licensing actions related to digital I&C. The Committee recommended that in the longer term, an alternative

process to the 30-minute criterion be developed to determine the conditions under which operator manual actions can be credited as a diverse protective function, and that the issue of spurious actuations needs to be examined further.

2. Draft Final Generic Letter 2007-XX, "Managing Gas Intrusion in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"

The Committee met with representatives of the NRC staff and NEI to discuss the draft final generic letter on gas ingress into the emergency core cooling system (ECCS), decay heat removal, and containment spray systems. The NRC staff stated that gas intrusion into the ECCS, decay heat removal, and containment spray systems can lead to loss of operability or degradation of performance. It may also lead to piping damage due to water hammer effects. Over the past 20 years, the NRC staff has published 20 Information Notices, two Generic Letters, and a NUREG, and also interacted with the nuclear industry many times regarding the gas intrusion issue. An event in 1997 at Oconee Unit 3 damaged two of the plant's three high-pressure injection pumps and rendered them nonfunctional. Following that event, an industry-wide initiative was undertaken to address the gas intrusion issue. Based on the industry's actions, the NRC staff concluded that no generic action was necessary at that time. However, despite the design and operational measures taken to prevent gas intrusion and accumulation in the above mentioned systems, and despite the high level of awareness of their potential impact on system performance, significant gas intrusion events have continued to occur, prompting the issuance of this Generic Letter.

The staff also presented a summary of the public comments received on this Generic Letter and the associated resolution. A representative of NEI indicated general agreement with the NRC staff position.

Committee Action

The Committee issued a letter to the Executive Director for Operations on this matter, dated October 19, 2007, recommending that the Generic Letter be issued as final.

3. Dissimilar Metal Weld Issue

The Committee met with representatives of the NRC staff and Dominion Engineering, Inc., to discuss the recent NRC staff and industry activities for addressing dissimilar metal weld issues resulting from the October 2006 inservice inspection of the Wolf Creek pressurizer nozzles. Analyses performed by the NRC staff in late 2006 and early 2007 indicated that large flaws, similar to those found at Wolf Creek, may lead to rupture before any measurable leakage occurs. As a result, the staff determined that inspections or mitigation activities on these welds at nine plants should be completed by the end of 2007 rather than during outages scheduled in spring of 2008. All other plants either do not have these types of welds or will have inspected or performed mitigation activities by the end of December 2007. The industry performed advanced finite element analyses to demonstrate that piping is not expected to rupture prior to leakage and that performing inspection or mitigation activities in the spring of 2008 at nine affected plants is acceptable. The NRC staff also developed an independent confirmatory analysis to review and verify the results of the industry analyses.

Representatives from Dominion Engineering, Inc., described the results of their advanced finite element analyses which demonstrate that the dissimilar metal welds are not expected to rupture prior to leakage. The NRC staff also described the results of its study. In general, there was

excellent agreement between the industry and staff results. Therefore, the staff concluded that the advanced finite element analyses provided reasonable assurance that the nine affected plants will continue to safely operate until scheduled outages in spring 2008.

#### Committee Action

The Committee issued a letter to the Executive Director for Operations on this matter, dated October 19, 2007, stating that the studies undertaken by the staff and industry have been timely and helped to provide a technical basis for assessing the dissimilar metal weld issue. The Committee also supported the efforts of the staff to pursue further study of welding residual stresses.

#### 4. Draft ACRS Report on the NRC Safety Research Program

The ACRS provides the Commission a biennial report, presenting the Committee's observations and recommendations concerning the overall NRC Safety Research Program. During the October 2007 meeting, the Committee discussed the draft ACRS report on the NRC Safety Research Program including the scope of long-term research the agency needs to consider.

#### Committee Action

The Committee plans to continue its discussion of the draft ACRS report on the NRC Safety Research Program during its November 2007 meeting.

#### 5. Meeting with NEI, EPRI, and INPO to Discuss Industry Activities

At the request of NEI, the Committee met with representatives of NEI, the Electric Power Research Institute (EPRI), and the Institute of Nuclear Power Operations (INPO) to discuss the current organizational structures, ongoing and planned programs and initiatives to address various issues, and how these organizations interface with each other and the nuclear industry. A representative of NEI described the NEI mission to provide a forum to resolve technical, regulatory, and business issues for the nuclear industry, in addition to ensuring policies promoting beneficial uses of the nuclear technology. He described how NEI accomplishes this mission through a business plan, various task forces, and other activities. A representative of EPRI described the various power industry technology areas in which this non-profit energy research consortium is involved, and described their mission for the nuclear power sector. He described the national and international membership of EPRI and how their strategic and action plans address key and emerging nuclear industry issues. A representative of INPO described how this non-profit organization promotes excellence in the nuclear power industry through self regulation and peer review. He described the four INPO cornerstone programs and focus areas that function to promote excellence, and how INPO works with the World Association of Nuclear Operators (WANO). The ACRS members asked probing questions to better understand how various industry activities are coordinated between these organizations, the industry's position on many evolving NRC program areas and activities, and industry activities to ensure the research and development infrastructure needed to support the re-growth of the nuclear industry.

#### Committee Action

This was an information briefing. No Committee action was required.

6. Draft Final Report on Quality Assessment of Selected NRC Research Projects

The Committee discussed the draft final report on its assessment of the quality of the NRC research projects on: Cable Response to Live Fire (CAROLFIRE) Testing; Fatigue Crack Flaw Tolerance in Nuclear Power Plant Piping; and Technical Review of the Online Monitoring Techniques for Performance Assessment.

Committee Action

The Committee issued a letter to the Director of the Office of Nuclear Regulatory Research, dated October 19, 2007, transmitting its final report on the assessment of the quality of selected NRC research projects for FY 2007.

RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS/EDO COMMITMENTS

There were no EDO responses to reconcile during this meeting.

OTHER RELATED ACTIVITIES OF THE COMMITTEE

During the period from September 9, 2007 through October 3, 2007, the following Subcommittee meetings were held:

- Digital I&C Systems – September 13, 2007

The Subcommittee discussed the Digital I&C Systems Project Plan and draft Interim Staff Guidance (ISG) proposed by the NRC staff to address the issues of diversity and defense-in-depth, communications, human factors, and cyber security.

- Reliability and Probabilistic Risk Assessment – October 2, 2007

The Subcommittee discussed the next generation probabilistic safety assessment (PSA) software and model representation standards.

- Economic Simplified Boiling Water Reactor (ESBWR) – October 2 - 3, 2007

The Subcommittee discussed the design of the ESBWR including operating characteristics and safety features and reviewed Chapter 2 (Site Characteristics), Chapter 8 (Electric Power), and Chapter 17 (Quality Assurance) of the staff's safety evaluation report with open items for the ESBWR Design Certification.

- Planning and Procedures – October 3, 2007

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

LIST OF MATTERS FOR THE ATTENTION OF THE EDO

- The Committee plans to review the draft final version of Revision 3 to Regulatory Guide 1.100, "Seismic Qualification of Electric and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants," (DG-1175), after reconciliation of public comments.
- The Committee would like the opportunity to review any proposed interim measures or topical reports developed as a result of Generic Letter 2007-XX, "Managing Gas Intrusion in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems."
- The Committee plans to continue discussion on its draft report on the NRC Safety Research Program during its November 2007 meeting.

PROPOSED SCHEDULE FOR THE 547<sup>th</sup> ACRS MEETING

The Committee agreed to consider the following topics during the 547<sup>th</sup> ACRS meeting, to be held on November 1-3, 2007:

- Extended Power Uprate Application for the Susquehanna Nuclear Power Plant.
- Meeting with Commissioner Lyons to discuss items of mutual interest.
- Vogtle Early Site Permit (ESP) Application.
- Staff's implementation of the lessons learned from the review of ESP applications.
- Assessment of the robustness of new nuclear plants.
- Selected chapters of the Safety Evaluation Report (SER) associated with the ESBWR design certification.
- Draft ACRS report on the NRC Safety Research Program.

Sincerely,

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William J. Shack  
Chairman

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Sincerely,

William J. Shack  
Chairman

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LETTER TO: The Honorable Dale E. Klein, Chairman  
U.S. Nuclear Regulatory Commission

FROM: William J. Shack, Chairman  
Advisory Committee on Reactor Safeguards

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