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

February 4, 2008

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

SUBJECT: SUMMARY REPORT – 548TH MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, DECEMBER 6-8, 2007, AND OTHER RELATED ACTIVITIES OF THE COMMITTEE

Dear Chairman Klein:

During its 548th meeting, December 6-8, 2007, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters and completed the following reports and letter.

REPORTS

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

- Draft Final NUREG-1829, "Estimating Loss-Of-Coolant Accident (LOCA) Frequencies Through the Elicitation Process," and Draft NUREG-XXXX, "Seismic Considerations for the Transition Break Size," dated December 20, 2007.

- Susquehanna Steam Electric Station Units 1 and 2 Extended Power Uprate Application, dated December 20, 2007.

LETTER

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

- AREVA Detect and Suppress Stability Solution and Methodology, dated December 27, 2007.

HIGHLIGHTS OF KEY ISSUES

1. Draft Final NUREG-1829, "Estimating Loss-of-Coolant Accident (LOCA) Frequencies Through the Elicitation Process," and Draft NUREG-XXXX, "Seismic Considerations for the Transition Break Size"

The Committee met with the representative of NRC staff to discuss draft final NUREG-1829 on estimating LOCA frequencies through the elicitation process, and draft NUREG-XXXX on seismic considerations for the transition break size (TBS).

The Commission has directed the staff to develop a risk-informed alternative to 10 CFR 50.46. An essential element of this effort is the selection of break size that has a mean frequency of occurrence of about 10^{-5} per reactor year.

These reports provide the basis for a conservative selection of this TBS.

Draft final NUREG-1829 presents the results of a formal expert elicitation process that was used to estimate generic boiling water reactor (BWR) and pressurized water reactor (PWR) passive-system LOCA frequencies associated with material degradation.

Draft NUREG-XXXX provides additional insights by investigating seismically induced failures in unflawed piping, flawed piping, and indirect piping failures caused by the failure of other components and supports. The results of the study indicate that, for PWRs, the likelihood of seismically induced failures in unflawed piping of size greater than the TBS is very low. Even for pipes with long surface flaws, the depths of these flaws must be very large for a high likelihood of failure during earthquakes. Inspection programs, leak detection systems, and other measures taken to eliminate failure mechanisms such as stress corrosion cracking would make the likelihood of such flaws very low.

Committee Action

The Committee issued a report to the NRC Chairman on this matter dated December 20, 2007, recommending that both NUREG reports be published. The Committee also recommended that regulatory decisions be based on the totality of the results from the sensitivity studies rather than the results from individual methods of expert judgment aggregation and that a set of consistent guidelines be established throughout the agency for the elicitation and aggregation of expert judgments including the performance of sensitivity studies.

2. AREVA Enhanced Option III Long Term Stability Solution

The Committee met with representatives of the NRC staff and AREVA to discuss the staff's draft Safety Evaluations (SEs) for Topical Reports BAW-10255P, Revision 2, "Cycle-Specific DIVOM Methodology Using the RAMONA5-FA Code," and ANP-10262P, Revision 0, "Enhanced Option III Long Term Stability Solution." Representatives of AREVA presented an overview of the detect and suppress methodology described in these topical reports. Topical Report BAW-10255P describes a plant-specific Option III stability methodology using AREVA analytical methods and codes. The proposed plant-specific stability methodology resolves the technical deficiencies associated with the application of the generic Option III DIVOM methodology to certain core thermal-hydraulic conditions and power densities. The proposed plant-specific DIVOM calculation methodology relies on the AREVA RAMONA5-FA 3D code. In ANP-10262P AREVA proposed extension of the plant-specific DIVOM methodology to operation at an expanded operating domain in which the power densities and power-to-flow ratios increase. Operation at the expanded operating domain is expected to decrease the stability of the reactor. Therefore, the Enhanced Option III method introduces additional design features to ensure that General Design Criteria – 12 (GDC-12) requirements are met. GDC-12 requires that the core be designed such that instability is not possible or the instability is detected and suppressed. The staff summarized the results of its evaluation of these topical reports.

Committee Action

The Committee issued a letter to the Executive Director for Operations on this matter dated December 27, 2007, concluding that the AREVA detect and suppress methodology is acceptable, subject to certain limitations and conditions. The Committee recommended that additional conditions be imposed to address issues regarding the extent and depth of the staff's review of the RAMONA5-FA code, the need for further documentation of the technical bases for the margins added to some of the key instability detect and suppress parameters, and the need for additional assessment of the validation of the RAMONA5-FA calculation based on the steady state dryout correlation.

3. State-of-the-Art Reactor Consequence Analysis (SOARCA)

The Committee met with representatives of the NRC staff and the Union of Concerned Scientists (UCS) to discuss the status of staff's efforts associated with the State-of-the-Art Reactor Consequence Analysis (SOARCA) Project. The staff is initially focusing on two sites, Peach Bottom in Pennsylvania, and Surry in Virginia. The staff presented its initial findings of the accident sequence selection, preliminary MELCOR insights, containment performance, and emergency preparedness for these two plants. The staff also presented the various options that it is evaluating for assessment of dose thresholds for latent cancer fatalities. A representative from UCS stated that the UCS is supportive of an authoritative and independent study that improves the technical credibility and accuracy of analyses of the consequences of severe accidents but is concerned that the SOARCA Project does not appear to be on track to fulfill such a role.

Committee Action

The Committee plans to consider a report on SOARCA during its February 2008 meeting.

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 December 2007 meeting, the Committee discussed its draft 2008 report to the Commission on the NRC Safety Research Program. The committee also discussed 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 February 2008 meeting.

5. Extended Power Uprate Application for the Susquehanna Power Plant

The Committee met with representatives of the NRC staff, Pennsylvania Power and Light (PPL or "the licensee"), and its consultant (AREVA) to discuss the extended power uprate (EPU) application for the Susquehanna Steam Electric Station (SSES) and the associated NRC staff's Safety Evaluation. The PPL application requested that operation of SSES Units 1 and 2 be increased to 3952 MWt, which corresponds to a 20 percent increase from the originally licensed thermal power.

The discussions focused on Member concerns regarding the applicability of AREVA analytical methods and codes.

A series of codes based on different void fraction correlations were used to determine the operating limits. Members expressed concern that the measured uncertainties and biases in these correlations were not propagated through the codes to determine their impact on the operating limits. The Members also noted the lack of measured data at higher void fraction. To address these concerns, the licensee and AREVA described the propagation of void fraction uncertainty by replacing the void fraction correlation used in the neutronics method with another correlation. The Members found that this replacement of correlations did not account for the appropriate measurement uncertainty and the uncertainty associated with each code was not propagated.

The Members also expressed concern regarding the potential for pellet-cladding-interaction (PCI) failures since SSES uses conventional nonbarrier fuel. The revised SE did not address PCI failures during slow transients considering the flatter EPU core designs and the associated changes in the KW/ft. The staff noted that PCI failures are not considered as part of the regulatory process.

Members raised issues associated with the adequacy and applicability of the database benchmarking the power distribution uncertainties applied to the safety limit calculations. The revised staff SE increased the power distribution uncertainties to account for the limited validation data and the applicability of the available data.

Members were also concerned with the impact of bypass voiding on the neutron monitoring readings during transient events such as a recirculation pump trip that would result in reduced core flow and higher in-channel and bypass voiding.

Committee Action

The Committee issued a report to the NRC Chairman on this matter dated December 20, 2007, recommending that the SSES Units 1 and 2 EPU application be approved subject to the condition that an appropriate margin be added to the operating limit minimum critical power ratio as an interim measure to account for uncertainties in the void fraction correlation and the lack of data for its validation at void fractions above 90 percent. The Committee also recommended that the staff perform a thorough review and assessment of the risk of PCI fuel failures with conventional fuel cladding during anticipated operational occurrences and that Review Standard 001 be improved to include cross referencing of related sections between the power uprate safety analysis report and the staff's SEs.

6. Subcommittee Report on ESBWR

The Chairman of the ESBWR Subcommittee provided a report to the Committee summarizing the results of the November 15, 2007, meeting with the NRC staff and GE-Hitachi to review selected chapters of the staff's Safety Evaluation Report (SER) with Open Items associated with the ESBWR design certification. This meeting focused on Chapter 9 (Auxiliary Systems), Chapter 10 (Steam and Power conversion Systems), Chapter 13 (Conduct of Operations), and Chapter 16 (Technical Specifications).

7. Election of ACRS Officers for CY 2008

The Committee elected William J. Shack as ACRS Chairman, Mario V. Bonaca as ACRS Vice Chairman, and Said Abdel-Khalik as Member-at-Large for the Planning and Procedures Subcommittee for CY 2008.

RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS/EDO COMMITMENTS

- The Committee considered the EDO's response of November 1, 2007, to comments and recommendations included in the September 26, 2007, ACRS report on the development of a technology-neutral regulatory framework. The Committee plans to continue discussions with the staff on this matter during future ACRS meetings.

- The Committee considered the EDO's response of November 23, 2007, to comments and recommendations included in the October 19, 2007, ACRS letter on the NRC staff's safety assessment of the industry study related to dissimilar metal weld issues in pressurizer nozzles. The Committee decided that it was satisfied with the EDO's response.

- The Committee considered the EDO's response of November 21, 2007, to comments and recommendations included in the October 16, 2007, ACRS report on the NRC staff's Digital Instrumentation and Control (I&C) Systems Project Plan and Interim Staff Guidance. The Committee decided that it was satisfied with the EDO's response.

OTHER RELATED ACTIVITIES OF THE COMMITTEE

During the period from November 4, 2007, through December 5, 2007, the following Subcommittee meetings were held:

- Thermal-Hydraulic Phenomena - November 14, 2007

The Subcommittee reviewed the staff's draft safety evaluations associated with topical reports BAW-10255P, Revision 2, "Cycle-Specific DIVOM Methodology Using the RAMONA5-FA Code," and ANP-10262P, Revision 0, "Enhanced Option III Long Term Stability Solution."

- Power Uprates - November 14, 2007

The Subcommittee reviewed the application by Pennsylvania Power and Light (PPL) for an extended power uprate for SSES Units 1 and 2 and the associated staff's safety evaluation.

- ESBWR — November 15, 2007

The Subcommittee discussed several SER Chapters with open items associated with the ESBWR design certification application.

- Regulatory Policies and Practices — November 16, 2007

The Subcommittee discussed the status of staff's efforts associated with the State-of-the-Art Reactor Consequence Analysis (SOARCA) Project.

- Reliability & Probabilistic Risk Assessment – November 27, 2007

The Subcommittee discussed the Draft Final NUREG-1829, "Estimating Loss-of-Coolant Accident (LOCA) Frequencies Through the Elicitation Process," and Draft NUREG-XXXX, "Seismic Considerations for the Transition Break Size."

- Planning and Procedures — December 5, 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.

- ABWR — December 5, 2007

The Subcommittee discussed the ABWR design and the South Texas Project Combined License Application.

LIST OF MATTERS FOR THE ATTENTION OF THE EDO

- The Committee plans to continue its discussion on SOARCA during its February 2008 meeting.

- The Committee plans to continue its discussion of its draft 2008 report to the Commission on the NRC Safety Research Program during its February 2008 meeting.

- The Committee would like the opportunity to review the applicability of the AREVA methodology for operation at the newly proposed General Electric Hitachi expanded domain (MELLLA+), before application to plant-specific submittal.

- The Committee would like the opportunity to review the staff's assessment of the RAMONA5-FA code.

- The Committee plans to continue its review of the staff's SER with Open Items associated with ESBWR design certification during a future meeting.

- The Committee plans to continue its review of the South Texas Project Combined License Application during a future meeting.

PROPOSED SCHEDULE FOR THE 549th ACRS MEETING

The Committee agreed to consider the following topics during the 549th ACRS meeting, to be held on February 7-9, 2008:

- Final Review of the License Renewal Application for the Vermont Yankee Nuclear Power Station

- Draft Final Revision 1 to Regulatory Guide 1.45 (DG-1173), "Guidance on Monitoring and Responding to Reactor Coolant System Leakage"

- Proposed Licensing Strategy for the Next Generation Nuclear Plant (NGNP)

- Cable Response to Live Fire (CAROLFIRE) Testing and Fire Model Improvement Program

- Proposed BWR Owners Group (BWROG) Topical Report on Methodology for Calculating Available Net Positive Suction Head (NPSH) for ECCS Pumps

- Draft ACRS Report on the NRC Safety Research Program

- State-of-the-Art Reactor Consequence Analysis (SOARCA) Program

Sincerely,

/RA/

William J. Shack

- Cable Response to Live Fire (CAROLFIRE) Testing and Fire Model Improvement Program

- Proposed BWR Owners Group (BWROG) Topical Report on Methodology for Calculating Available Net Positive Suction Head (NPSH) for ECCS Pumps

- Draft ACRS Report on the NRC Safety Research Program

- State-of-the-Art Reactor Consequence Analysis (SOARCA) Program

Sincerely,

/RA/

William J. Shack

Distribution:
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From: William J. Shack, ACRS Chairman

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