



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

SL-0518

March 10, 2004

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Diaz:

SUBJECT: SUMMARY REPORT - 509th MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, FEBRUARY 5-7, 2004 AND OTHER RELATED ACTIVITIES OF THE COMMITTEE

During its 509th meeting, February 5-7, 2004, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters and completed the following report, letter, and a memorandum.

REPORT

Report to Nils J. Diaz, Chairman, NRC from Mario V. Bonaca, Chairman, ACRS Subject: Review and Evaluation of the Nuclear Regulatory Commission Safety Research Program, Advance Copy to the Commission, February 27, 2004.

LETTER

Letter to William D. Travers, Executive Director for Operations, NRC from Mario V. Bonaca, Chairman, ACRS, Subject: Draft Safety Evaluation Report for the Economic and Simplified Boiling Water Reactor (ESBWR) Pre-Application Review, dated February 12, 2004.

MEMORANDUM

Memorandum to William D. Travers, Executive Director for Operations, NRC, from John T. Larkins, Executive Director, ACRS, Subject: Errata Sheets for Regulatory Guides [1.184, Decommissioning of Nuclear Power Reactors, and 1.185, Standard Format and Content for Post-Shutdown Decommissioning Activities Report], dated February 9, 2004.

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HIGHLIGHTS OF KEY ISSUES

1. ESBWR Design – Thermal-Hydraulic Issues

The Committee heard presentations by and held discussions with representatives of the NRC staff and General Electric Nuclear Energy (GENE) regarding the staff's draft Safety Evaluation Report (SER) related to the pre-application review of the Economic Simplified Boiling Water Reactor (ESBWR) design, specifically the application of the TRACG code in analyzing ESBWR response to a loss-of-coolant accident (LOCA) scenario. The application of the TRACG code, which employs a two-fluid model for two-phase flow, to the ESBWR design is in two areas - the reactor coolant system response to a LOCA and the containment system response to the LOCA. The staff performed independent analysis of the ESBWR reactor coolant system behavior under a LOCA scenario by using the TRACG code and the staff's TRACE / CONTAIN computer code. Based on its review of the information embrittled by GENE and its independent evaluations, the staff has decided to approve the TRACG code for use in analyzing the ESBWR response to a LOCA scenario.

Committee Action

The Committee issued a letter to the EDO dated February 12, 2004, agreeing with the staff's decision to approve the TRACG code for use in analysis of the ESBWR in response to a LOCA scenario. The Committee noted that the staff had improved the level of detail and the rationale behind its SER, and supported the staff's practice of examining the details of the code directly, and running them on NRC computers. It will continue to follow the staff's review of the ESBWR, through the remainder of the pre-application phase, as well as the Design Certification review.

2. South Texas Project Cause Investigation of the Reactor Vessel Bottom Mounted Penetration Leakage

The Committee heard a presentation by representatives of the Office on Nuclear Reactor Regulation (NRR) regarding the findings of the root cause investigation of the South Texas Project (STP) bottom mounted instrumentation nozzle leakage. The staff stated the bottom head leakage occurred at STP Unit 1 on April 12, 2003. Nondestructive examinations confirmed the presence of axial cracks and samples confirmed the presence of boron and lithium. An NRC Special Inspection began on May 5, 2003. The licensee identified the root cause as a lack of fusion welds created during vessel fabrication that connected flaws in J-groove welds to wetted surfaces early in the plant's operation. Flooding by reactor coolant in these welds created conditions to support primary water stress corrosion cracking.

The staff concluded that the licensee's explanation is consistent with available information. They also indicated that STP penetrations are not uniquely susceptible and therefore, concluded that reliable inspections of PWR bottom mounted nozzles are necessary to ensure that reactor coolant pressure boundary leakage, were it to occur, would be identified and addressed in a timely manner

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Conclusion

This was an information briefing and no Committee action was taken.

3. Resolution of Certain Items Identified by the ACRS in NUREG-1740 Related to the Differing Professional Opinion on Steam Generator Tube Integrity

The Committee heard presentations by and held discussions with representatives of the NRC staff and its contractors regarding the status of the staff's resolution of certain items identified by the ACRS in NUREG-1740, "Voltage-Based Alternative Repair Criteria," related to the differing professional opinion (DPO) on steam generator tube integrity. The staff presented the resolution of certain items in the Steam Generator Action Plan (SGAP) which are associated with the DPO. These include, for example, steam generator tube integrity during main steamline break, correlation between voltage and leakrate for 7/8" steam generator tubes, and use of appropriate iodine spiking factor in the dose calculations for the design basis accident. In addition, the staff presented the progress on the resolution of remaining items which include creep failure of primary system passive components such as pressurizer surge line and the hot leg, and improved methods for assessing the risk associated with steam generator tubes under severe accident conditions.

Committee Action

The Committee discussed a proposed report and decided to continue its discussion of this report during the March 4-6, 2004 ACRS meeting.

Also, the Committee decided that the ACRS Subcommittees on Materials and Metallurgy and on Thermal Hydraulic Phenomena should hold meetings, as needed, to discuss the progress made by the staff in resolving the issues identified by the ACRS in NUREG-1740.

4. Evaluation of the Effectiveness (Quality) of the NRC Safety Research Programs

The Office of Nuclear Regulatory Research (RES) has been charged by the EDO to establish a process to evaluate the effectiveness (quality) and utility of its programs. This evaluation is mandated by the Government Performance and Results Act (GPRA) and needs to be in place during the next fiscal year. The Committee has agreed to assist RES in assessing the effectiveness and utility of the NRC research programs. The Committee review will focus on assessing the quality of the NRC research programs. Cost characteristics and timeliness of the results will not be addressed in ACRS evaluation. Timeliness will be measured as a part of "relevance" review, which is performed as a separate but related part of the overall RES quality metric. During the February 2004 ACRS meeting, the Committee discussed the strategy for reviewing the quality of the RES Programs.

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Committee Action

The Committee plans to discuss a process for developing a quantitative metric (a numerical grade) to be used for evaluating the quality of selected NRC research projects during its March 3-6, 2004 meeting.

5. ACRS Report on the NRC Safety Research Program

The Committee completed its 2004 report entitled, "Review and Evaluation of the Nuclear Regulatory Commission Safety Research Program."

Committee Action

The Committee provided an advance copy of its 2004 report to the Commission on the overall NRC Safety Research Program on February 26, 2004. The final report will be published as NUREG-1635, Vol. 6. The Committee plans to provide its next report to the Commission on the "overall" NRC Safety Research Program in March 2006.

6. Subcommittee Report – ACR-700 Design

The Future Plant Designs Subcommittee Chairman provided a report to the Committee on the Subcommittee's review of the ACR-700 design that was held on January 13, 2004. He stated that the ACR-700 is an advanced CANDU (Canada Deuterium Uranium) design that utilizes horizontal fuel channels passing through a heavy-water moderator tank. The ACR-700 utilizes light water as coolant within the fuel channels, whereas operating CANDU reactors utilize heavy water. The ACR-700 will be designed to have a negative void reactivity coefficient so that if boiling occurs within the fuel channels, the reactor power will decrease. The negative void reactivity coefficient will be achieved by using slightly enriched uranium fuel elements rather than the natural uranium fuel used in operating CANDU reactors. The reactor core will be smaller than operating CANDU reactors with fewer fuel channels. The basic layout of the reactor coolant system allows dissipation of heat through natural circulation, if all electrical power to the reactor coolant pumps fails. There are 284 horizontal pressure tubes made from an alloy of Zirconium and 2.5 wt% Niobium in which trace elements, particularly chlorine, copper and iron, are closely controlled. The NRC staff plans to identify where new staff positions, regulations and regulatory guidance are needed to address the unique characteristics of the ACR-700 design. In the application of existing regulations and guidelines, the staff may need to interpret the guidance developed for light water reactors (LWRs) for application to non-LWR concepts and issues under review. The approach is directed toward ensuring an equivalent level of safety to that of current generation LWRs. The NRC staff plans to issue a Safety Assessment Report (SAR) by September 2004 and forward a draft SAR to the ACRS in July 2004.

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Committee Action

This was an information briefing and no Committee action was required at this time. The Committee plans to review the SAR during a future meeting.

RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS/EDO COMMITMENTS

- The Committee considered the response from the EDO dated December 22, 2003, to the ACRS letter dated September 30, 2003, concerning the Draft Final Revision 3 to Regulatory Guide 1.82, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident."

The Committee noted that although the EDO agreed with the ACRS recommendation to issue Revision 3 to Regulatory Guide 1.82 for use by the industry, the EDO did not agree with many of the technical comments and recommendations that the Committee had made, and did not provide a technical response to many of the others. The Committee agreed to consider this response again, in detail, at the March 2004 meeting, and prepare a response to the EDO which will identify the Committee's concerns and request a more detailed, technical response from the staff.

- The Committee considered the response from the EDO dated December 19, 2003, to the ACRS letter dated November 13, 2003, concerning ACRS Review of Routine Updates to 10 CFR 50.55a, "Codes and Standards." The Committee decided that it was satisfied with the EDO's response.
- The Committee considered the response from the EDO dated December 24, 2003, to the ACRS letter dated November 17, 2003, concerning Proposed Resolution of Generic Issue-189, "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident." The Committee decided that it was satisfied with the EDO's response.

The Committee would like to be kept informed of the staff's activities associated with the resolution of GSI-189.

- The Committee considered the response from the EDO dated January 15, 2004, to the ACRS letter dated December 12, 2003, concerning Regulatory Effectiveness of Unresolved Safety Issue A-45, "Shutdown Decay Heat Removal Requirements." The Committee decided that it was satisfied with the EDO's response.

The Committee would like to be kept informed of the results of the staff's review of the operating experience of licensee performance in the area of shutdown operations. Also, the Committee would wish to be kept informed of future regulatory effectiveness studies and any follow-on actions that evolve from them.

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The Committee would like to be kept informed of the results of further analyses to be considered by the staff to identify the limiting Thermal-hydraulic conditions to reduce uncertainties associated with the credit taken for enhancing the DHR function under accident conditions.

- The Committee considered the response from the EDO dated January 15, 2004, to the ACRS letter dated December 12, 2003, concerning Draft NUREG-0800, Standard Review Plan Chapter 18.0, Human Factors Engineering. The Committee decided that it was satisfied with the EDO's response.

The Committee would like to be kept informed of the insights gained from implementing the revised SRP Chapter 18.

- The Committee considered the response from the EDO dated January 15, 2004, to the ACRS letter dated December 12, 2003, concerning Draft 10 CFR Part 50 Construction Inspection Program Framework Document. The Committee was satisfied with the EDO response.

The Committee would like to be kept informed of the staff's plans to consider the ACRS recommendations in refining the inspection sampling process discussed in the framework document, and the resolution of the sampling process issue.

OTHER RELATED ACTIVITIES OF THE COMMITTEE

During the period from December 4, 2003, through February 4, 2004, the following Subcommittee meetings were held:

- Future Plant Designs - January 13, 2004

The Subcommittee reviewed the design features and pre-application review of the ACR-700 design.

- Thermal-Hydraulic Phenomena - January 14-15, 2003

The Subcommittee reviewed the staff's draft SER related to the pre-application review of the ESBWR design, specifically the application of the TRACG code in analyzing the ESBWR response to a LOCA scenario.

- Planning and Procedures - January 29-30, 2004

The Subcommittee discussed several matter, including internal ACRS practices and procedures, ACRS effectiveness, current ACRS challenges, and future technical expertise on ACRS.

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- Materials and Metallurgy and Thermal-Hydraulic Phenomena - February 3-4, 2004

The joint Subcommittee reviewed the staff's resolution of certain items identified by the ACRS in NUREG-1740, "Voltage-Based Alternative Repair Criteria," as well as the status of resolution of remaining items.

- Planning and Procedures - February 4, 2004

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 ACRS Subcommittees on Materials and Metallurgy and on Thermal-Hydraulic Phenomena plan to hold meetings, as needed, to discuss the progress made by the staff in resolving the issues identified by the ACRS in NUREG-1740.
- The ACRS plans to continue its review the NRC staff activities associated with the pre-application reviews of the ESBWR and ACR-700 designs.

PROPOSED SCHEDULE FOR THE 510th ACRS MEETING

The Committee agreed to consider the following topics during the 510th ACRS meeting, to be held on March 3-6, 2004:

- Safeguards and Security Matters (Closed)
- License Renewal Application for the H. B. Robinson Steam Electric Plant, Unit 2
- Interim Review of the AP1000 Design
- License Renewal Application for the Virgil C. Summer Nuclear Station
- Proposed Criteria for ACRS Evaluation of the Effectiveness (Quality) of the NRC Safety Research Programs
- Divergence in Regulatory Approaches Between U.S. and Several Other Countries
- Joint Meeting of the ACRS/ACNW with the EDO/Office Directors of NRR/RES/NMSS
- Resolution of certain items identified by the ACRS in NUREG-1740, Voltage-Based Alternative Repair Criteria, related to the DPO on steam generator tube integrity.

Sincerely,

/RA/

Mario V. Bonaca
Chairman