



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

March 6, 2008

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

Dear Chairman Klein:

SUBJECT: SUMMARY REPORT – 549<sup>th</sup> MEETING OF THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, FEBRUARY 7-9, 2008, AND OTHER RELATED ACTIVITIES OF THE COMMITTEE

During its 549<sup>th</sup> meeting, February 7-9, 2008, the Advisory Committee on Reactor Safeguards (ACRS) discussed several matters and completed the following reports and letters.

REPORTS

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

- Review and Evaluation of the NRC Safety Research Program, dated March 6, 2008.
- State-of-the-Art Reactor Consequence Analyses (SOARCA) Project, dated February 25, 2008.

LETTERS

Letter to David J. O'Brien, Commissioner, Department of Public Service, State of Vermont, from William J. Shack, Chairman, ACRS:

- Final ACRS Review of the Vermont Yankee License Renewal Application, dated February 19, 2008.

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

- Draft Final Revision 1 to Regulatory Guide 1.45, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," dated February 22, 2008.
- Cable Response To Live Fire (CAROLFIRE) Testing and Fire Model Improvement Program, dated February 28, 2008.

## HIGHLIGHTS OF KEY ISSUES

### 1. License Renewal Application for the Vermont Yankee Nuclear Power Station

The Committee met with the representatives of Entergy Nuclear Operations, Inc., (the applicant) and the NRC staff to discuss the license renewal application for the Vermont Yankee Nuclear Power Station (VYNPS) and the associated Safety Evaluation Report (SER). The operating license for VYNPS expires on March 21, 2012. The applicant has requested approval for continued operation for a period of 20 years beyond the current license expiration date.

In the SER, with the exception of an issue related to environmentally assisted fatigue (EAF) of reactor coolant pressure boundary components, the staff documented its review of the license renewal application and other information submitted by Entergy and obtained during the audits and inspections conducted at the plant site. The staff reviewed: the completeness of the applicant's identification of structures, systems, and components that are within the scope of license renewal; the integrated plant assessment process; the applicant's identification of the plausible aging mechanisms associated with passive, long-lived components; the adequacy of the applicant's Aging Management Programs; and the identification and assessment of time-limited aging analyses requiring review.

For the remaining EAF issue, the applicant has submitted additional confirmatory analysis information that is currently being reviewed by the staff. The staff currently plans to complete the final SER, including resolution of the EAF issue, such that the ACRS will be able to complete its review of the VYNPS license renewal application at its March 2008 meeting.

#### Committee Action

The Committee plans to continue its discussion of the VYNPS License Renewal Application and the associated final SER, especially the resolution of the EAF issue, during its March 2008 meeting.

### 2. Draft Final Revision 1 to Regulatory Guide 1.45, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage"

The Committee met with representatives of the NRC staff regarding the proposed Revision 1 to Regulatory Guide 1.45. Regulatory Guide 1.45 was first issued in 1973 to provide guidance on leak detection in containment. It recommended that three separate methods of measurement be employed to detect leaks of one gallon per minute or less from unidentified sources. Following the Davis-Besse reactor vessel head event, one of the areas identified for examination was the need for additional guidance in the area of leak detection from the reactor coolant system. An examination of operating experience showed that over half of reported leaks were too small to be detected by measurement methods and were found by visual inspection. Large leaks were detected by the installed measurement systems. The Revised Regulatory Guide recommends the use of local detection methods in potentially critical areas such as those where small leaks could expose low-alloy steel to boric water. Regulatory Guide 1.45, Revision 1 also recommends inclusion of monitoring and trending procedures in the plant technical specifications. Regulatory Guide 1.45, Revision 1 will be applied only to new reactors.

### Committee Action

The Committee issued a letter to the Executive Director for Operations on this matter, dated February 22, 2008, recommending that Regulatory Guide 1.45, Revision 1 be issued.

#### 3. Proposed Licensing Strategy for the Next Generation Nuclear Plant (NGNP)

The Committee met with the representatives of the Department of Energy (DOE) and the NRC staff to discuss the development of the draft licensing strategy report prepared by a DOE and NRC joint working group in response to the Energy Policy Act of 2005 (EPAct). The EPAct directed DOE and the NRC to describe the ways in which the current light water reactor licensing requirements could be adapted for the prototype NGNP, the analytical tools that would be needed by the NRC to independently verify the NGNP safety performance, research and development (R&D) activities the NRC will need to conduct to review the NGNP license application, and a budget estimate associated with the licensing strategy. The licensing strategy development report needs to be submitted to Congress by August 7, 2008. The EPAct also mandated that the NGNP provide process heat for hydrogen generation.

The DOE and NRC staff had undertaken jointly a “phenomena identification and ranking table (PIRT) process” to assess the knowledge base for key phenomena, the adequacy and developmental needs for the analytical tools, and the R&D needs. The DOE staff described the technical challenges and experience associated with the high-temperature gas-cooled reactor technology and the associated use of process heat for hydrogen generation. DOE representatives also described the operating conditions for a pre-conceptual design, the needed technology development areas, ongoing and future test programs, and R&D needs. The NRC staff discussed the options for the licensing approach, highlights of the PIRT findings, needs for tools and data to perform confirmatory safety analyses, and other infrastructure needs.

The ACRS members discussed their comments and questions with the staff. The interface between the NGNP reactor and the hydrogen generation plant was one area of ACRS interest.

### Committee Action

The Committee plans to continue its discussion of the NGNP issues during its April 2008 meeting.

#### 4. Cable Response to Live Fire (CAROLFIRE) Testing and Fire Model Improvement Program

The Committee met with representatives of the NRC staff, Sandia National Laboratories, and the National Institute of Standards and Technology (NIST) to discuss results of the Cable Response to Live Fire (CAROLFIRE) Testing and Fire Model Improvement Program. This Program was based on Regulatory Issue Summary (RIS) 2004-03 Rev. 1, which had explicitly described a set of cable/circuit configurations in need of more research to determine failure characteristics.

The purpose of the CAROLFIRE Project was to experimentally investigate the various failure modes of electrical cables when exposed to fires, in configurations described in the RIS as needing more research. During the meeting, NRC and NIST staff representatives described a series of experiments in which cables were subjected to a fire environment in both a small-scale, highly controlled facility, and in a larger, more realistic room-sized facility, while observing the times and various modes of failure. A calculational model for estimating the internal temperature of a cable as a function of time had also been developed and compared to the data. The results of the program will be published in a NUREG/CR report. The Members provided some suggestions for improving the presentation of the results, with the aim of making these results more useful to the users.

#### Committee Action

The Committee issued a letter to the Executive Director for Operations on this matter, dated February 28, 2008, recommending that NUREG/CR-6931, "Cable Response to Live Fire (CAROLFIRE)," including the electronic data sets, be published. The Committee also recommended that the staff continue to analyze the CAROLFIRE data and develop additional guidance regarding the use of the results.

#### 5. Boiling Water Reactor Owners Group's (BWROG) Proposed Containment Overpressure Credit Methodology

The Committee was briefed by representatives of the NRC staff and the Boiling Water Reactor Owners Group (BWROG) regarding a proposed containment overpressure methodology which is documented in the Topical Report, NEDO-3337P, "Containment Overpressure Credit for Net Positive Suction Head (NPSH)," Revision 0. This methodology was developed to address some of the comments made by the ACRS during its review of the extended power uprate (EPU) applications. The Committee commented on the acceptability of relying on containment overpressure credit in meeting the required NPSH and the increases in both the credit and the duration needed for EPU operation. The Committee also commented on the lack of consistency in the licensees' approaches in determining the containment overpressure credit, pointing out the need for a well-defined risk assessment for some of the event scenarios.

The BWROG briefed the Committee on the proposed guidance process and the newly developed statistical methodology for calculating the containment response and the overpressure credit needed. This methodology will reduce some of the conservatism currently employed in the deterministic containment analyses methodology.

The NRC staff presented the regulatory history and positions on crediting containment overpressure in meeting the required NPSH. In addition, the NRC staff discussed its positions for accepting containment overpressure credit. The staff stated that if there is no practical alternative, containment overpressure credit is accepted, provided that the containment overpressure is calculated in a conservative manner that minimizes the available containment pressure response.

The ACRS members provided feedback on issues that may need to be addressed in more detail before the approval of the proposed methodology. The members commented that the Topical Report should address in more detail the sampling and the uncertainty distribution method,

including the manner in which interdependent and correlated variables are defined. Members also commented that in developing the variations on key parameters, the operator actions should also be factored in. The containment response calculations should also account for the accuracy of the code models in addition to the uncertainty range of the key input parameters.

#### Committee Action

This was an information briefing. No Committee action was necessary. The Committee plans to review the staff's evaluation of the proposed methodology described in Topical Report, NEDO-33347P, "Containment Overpressure Credit for Net Positive Suction Head (NPSH)," Revision 0.

#### 6. 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 February 2008 meeting, the Committee completed its biennial review and evaluation of the Reactor Safety Research Program sponsored by the NRC.

#### Committee Action

The Committee issued a report to the Commission, dated March 5, 2008, transmitting an advance copy of its 2008 biennial report on, "Review and Evaluation of the Nuclear Regulatory Commission Safety Research Program." The final report will be published as NUREG-1635, Vol. 8.

#### RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS/EDO COMMITMENTS

- The Committee considered the EDO's response of February 1, 2008, to comments and recommendations included in the November 20, 2007, ACRS letter concerning Chapters 2, 5, 8, 11, 12, and 17 of the NRC staff's SER with Open Items related to the certification of the ESBWR [Economic Simplified Boiling Water Reactor] design. The Committee decided that it was satisfied with the EDO's response. **The EDO stated that the staff has sent a request for additional information to General Electric-Hitachi Nuclear Energy (GEH) to obtain the necessary information for developing the source term of radioactive materials released into the reactor coolant system. The EDO committed to provide this information to ACRS.**
- The Committee considered the EDO's response of December 6, 2007, to comments and recommendations in the October 19, 2007, ACRS letter concerning the draft final Generic Letter 2007-02, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems." The Committee decided that it was satisfied with the EDO's response. **The EDO indicated that the staff will provide the ACRS an opportunity to review proposed interim measures or topical reports developed as a result of this Generic Letter.**

- The Committee considered the EDO's response of January 30, 2008, to comments and recommendations included in the December 20, 2007, ACRS letter concerning 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 decided it was satisfied with the EDO's response.
- The Committee considered the EDO's response of January 30, 2008, to comments and recommendations included in the December 27, 2007, ACRS letter concerning the AREVA Detect and Suppress Stability Solution and Methodology. The Committee decided that it was satisfied with the EDO's response.
- The Committee considered the EDO's response of December 27, 2007, to comments and recommendations included in the November 19, 2007, ACRS letter on the staff's implementation of Lessons Learned from Reviews of Early Site Permit (ESP) Applications. The Committee decided that it was satisfied with the EDO's response.
- The Committee considered the EDO's response of December 28, 2007, to comments and recommendations included in the November 20, 2007, ACRS letter on the Southern Nuclear Operating Company (SNC) Application for the Vogtle Early Site Permit and the associated NRC Safety Evaluation Report (SER) with Open Items. The Committee decided that it was satisfied with the EDO's response.

#### OTHER RELATED ACTIVITIES OF THE COMMITTEE

During the period from December 9, 2007, through February 6, 2008, the following Subcommittee meetings were held:

- Safety Research Program – December 18, 2007

The Subcommittee discussed the scope of long-term research the agency needs to consider. At this meeting, the Subcommittee had the benefit of presentations by John Ahearn, former NRC Chairman, Alex Marion, Executive Director of Nuclear Operations and Engineering at the Nuclear Energy Institute (NEI), Tom Miller of U.S. Department of Energy (DOE), and Robert Hill from Argonne National Laboratory representing the DOE's Global Nuclear Energy Partnership (GNEP). During this meeting, the Subcommittee also had presentations from Brian Sheron, Director, Office of Nuclear Regulatory Research, and Gary Holohan, Deputy Director, Office of New Reactors.

- Reliability & Probabilistic Risk Assessment – December 19, 2007

The Subcommittee discussed Draft NUREG-1855, "Guidance on the Treatment of Uncertainties in Risk-Informed Decisionmaking."

- ESBWR – January 16 and 17, 2008

The Subcommittee discussed Chapters 4, 6, 15, and 21 of the SER with Open Items associated

with the ESBWR design certification application.

- Thermal-Hydraulic Phenomena, and Reliability and Probabilistic Risk Assessment – January 18, 2008

The Subcommittees discussed results of the Cable Response to Live Fire (CAROLFIRE) Testing and Fire Model Improvement Program and related matters.

- Safety Research Program –February 5, 2008

The Subcommittee met with Jacques Repussard and Michel Schwarz representing France's Institut de Radioprotection et de Sûreté Nucléaire (IRSN); Carlo Vitanza representing the Nuclear Energy Agency (NEA) of the Organization of Economic Cooperation and Development (OECD); and Christer Viktorsson representing the Nuclear Installation Safety Division of the International Atomic Energy Agency (IAEA). This meeting was held to obtain international perspectives on long-term reactor safety research.

- Future Plant Designs – February 6, 2008

The Subcommittee discussed the proposed licensing strategy for the Next Generation Nuclear Plant and related matters.

- Planning and Procedures – February 6, 2008

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 Vermont Yankee Nuclear Power Station license renewal application and the associated final SER, specifically the resolution of the environmentally assisted fatigue issue, during its March 2008 meeting.
- The Committee plans to review Chapters 9, 10, 13, and 16 of the SER with Open Items associated with the ESBWR design certification application during its March 2008 meeting.
- The Committee plans to continue its review of the proposed licensing strategy for NGNP during its April 2008 meeting.
- The Committee plans to review the staff's evaluation of the BWROG containment overpressure credit methodology described in the Topical Report, NEDO-33347P, "Containment Overpressure Credit for Net Positive Suction Head (NPSH)," Revision 0.
- The Committee would like to be kept informed of the staff's progress in analyzing its CAROLFIRE test data and developing guidance for future use of these data.

- The Committee plans to have further interaction with the staff to discuss the progress made in the SOARCA project.

PROPOSED SCHEDULE FOR THE 550th ACRS MEETING

The Committee agreed to consider the following topics during the 550th ACRS meeting, to be held on March 6-8, 2008:

- License Renewal Application and the final SER for the James A. FitzPatrick Nuclear Power Plant
- License Renewal Application and the final SER for the Vermont Yankee Nuclear Power Station
- Selected Chapters of the SER Associated with the ESBWR Design Certification Application
- Meeting with Commissioner Lyons regarding items of mutual interest.
- Anticipated Future Committee Schedule and Workload

Sincerely,

*/RA/*

William J. Shack  
Chairman



- The Committee plans to have further interaction with the staff to discuss the progress made in the SOARCA project.

**PROPOSED SCHEDULE FOR THE 550th ACRS MEETING**

The Committee agreed to consider the following topics during the 550th ACRS meeting, to be held on March 6-8, 2008:

- License Renewal Application and the final SER for the James A. FitzPatrick Nuclear Power Plant
- License Renewal Application and the final SER for the Vermont Yankee Nuclear Power Station
- Selected Chapters of the SER Associated with the ESBWR Design Certification Application
- Meeting with Commissioner Lyons regarding items of mutual interest.
- Anticipated Future Committee Schedule and Workload

Sincerely,

*/RA/*

William J. Shack  
Chairman

**Distribution:**

RidsSecvMailCenter	RidsEDOMailCenter	RidsNRROD	
RidsNMSSOD	RidsESMEOD	RidsOCAMailCenter	
RidsNSIROD	RidsRESOD	RidsNROOD	
RidsOIGMailCenter	RidsOGCMailCenter	RidsASIBPMailCenter	
RidsOCAAMailCenter	RidsOPAMailCenter	RidsRGN1MailCenter	
RidsRGN2MailCenter	RidsRGN3MailCenter	RidsRGN4MailCenter	
BChamp ABates JPerry SDuraiswamy DPelton	CSantos DBessette HNourbakhsh GShukla PTressler	MBanerjee CHammer JFlack CJaegers JDelgado	SMcKelvin LMike ZAbdullahi DFischer HVanderMolen

ML080630624

<b>NAME</b>	GShukla	GShukla/SUNSI	CSantos	FPGillespie	FPG for WJS
<b>DATE</b>	03/04/08	03/04/08	03/05/08	03/06/08	03/06/08

**OFFICIAL RECORD COPY**