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March 8 - 9, 2007

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REPORTS:

The following reports to Dale E. Klein, Chairman, NRC, from William J. Shack, Chairman, ACRS:

1. Assessment of Aircraft Impacts on New Plants, **dated March 19, 2007**
(Official Use Only)
2. Development of the TRACE Thermal-Hydraulic System Analysis Code, **dated March 22, 2007**

LETTERS:

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

1. Proposed Revision to Standard Review Plan Section 15.9, "BWR Stability," **dated March 22, 2007**
2. Proposed Revision 3 to Standard Review Plan Section 15.0, "Introduction - Transient and Accident Analyses," **dated March 22, 2007**
3. Proposed NRC Staff and Industry Activities for Addressing Dissimilar Metal Weld Issues Resulting from the Wolf Creek Pressurizer Weld Inspection Results, **dated March 22, 2007**

MEMORANDA:

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

1. Proposed Revisions to Standard Review Plan Sections in Support of New Reactor Licensing, **dated March 14, 2007**
2. ACRS Review of Regulatory Guides 5.69 and 5.70 Supporting the 10 CFR 73.1 Design-Basis Threat Rulemaking, **dated March 9, 2007** (Official Use Only)
3. Comments Regarding Staff Review of Thermal-hydraulic Methodologies, **dated March 14, 2007**
4. Proposed Revision to 10 CFR 50.55a, "Codes and Standards," **dated March 9, 2007**

APPENDICES

- I. *Federal Register Notice*
- II. Meeting Schedule and Outline
- III. Attendees
- IV. Future Agenda and Subcommittee Activities
- V. List of Documents Provided to the Committee

MINUTES OF THE 540th MEETING OF THE
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
March 8 - 9, 2007
ROCKVILLE, MARYLAND

The **540th** meeting of the Advisory Committee on Reactor Safeguards (ACRS) was held in Conference Room T2-B3, Two White Flint North Building, Rockville, Maryland, on **March 8 - 9, 2007**. Notice of this meeting was published in the *Federal Register* on **February 15, 2007** (72 FR **7481**) (Appendix I). The purpose of this meeting was to discuss and take appropriate action on the items listed in the meeting schedule and outline (Appendix II). The meeting was open to public attendance.

A transcript of selected portions of the meeting is available in the NRC's Public Document Room at One White Flint North, Room 1F-19, 11555 Rockville Pike, Rockville, Maryland. Copies of the transcript are available for purchase from Neal R. Gross and Co., Inc., 1323 Rhode Island Avenue, NW, Washington, DC 20005. Transcripts are also available at no cost to download from, or review on, the Internet at <http://www.nrc.gov/ACRS/ACNW>.

ATTENDEES

ACRS Members: Dr. William J. Shack (Chairman), Dr. Mario V. Bonaca (Member-at-large), Dr. Said Abdel-Khalik, Dr. George E. Apostolakis, Dr. Sanjoy Banerjee, Dr. Michael Corradini, Dr. Thomas S. Kress, Mr. Otto L. Maynard, and Dr. Dana A. Powers. For a list of other attendees, see Appendix III.

I. Chairman's Report (Open)

[Note: Mr. Frank P. Gillespie was the Designated Federal Official for this portion of the meeting.]

Dr. William J. Shack, Committee Chairman, convened the meeting at 8:30 A.M. He announced in his opening remarks that the meeting was being conducted in accordance with the provisions of the Federal Advisory Committee Act. In addition, he reviewed the agenda for the meeting and noted that no written comments or requests for time to make oral statements from members of the public had been received. Dr. Shack also noted that a transcript of the open portions of the meeting was being kept and speakers were requested to identify themselves and speak with clarity and volume. He discussed the items of current interest and administrative details for consideration by the full Committee.

II. Technical Basis Associated with the Proposed NRC Staff Action for Dealing with the Dissimilar Metal Weld Issue (Open/Closed)

[Note: Mr. Gary Hammer was the Designated Federal Official for this portion of the meeting.]

The Committee met with representatives of the NRC staff, the Nuclear Energy Institute (NEI), and FirstEnergy to discuss proposed NRC staff and industry activities for addressing dissimilar metal weld issues resulting from the October 2006 inservice inspection of the Wolf Creek

pressurizer nozzles. The staff presented an evaluation of the safety significance of the circumferential indications and the implications to other plants with these dissimilar metal butt welds. The results of the analysis performed by the staff revealed that in some cases the flaws may lead to a rupture before any leakage occurs. As a result, the staff has determined that inspections or mitigation activities on these welds at nine plants should be completed by the end of 2007 rather than the spring of 2008. All other plants either do not have these type of welds or will have inspected or performed mitigation activities by December 2007. NEI and FirstEnergy representatives provided the basis for completing the inspections or mitigation activities in 2008 and described an effort to develop an advanced finite element fracture mechanics analysis capability that can provide a more rigorous basis for their arguments. Licensees have committed to complete inspection or mitigation activities by December 2007 if this finite element analysis is unsuccessful at demonstrating leak-before-break. Licensees have also committed to implement enhanced reactor coolant leakage monitoring as a compensatory action in order to ensure timely plant shutdown should leakage occur. The staff stated that confirmatory action letters will be issued in the near future to confirm these commitments. The staff also stated that it is working closely with the industry on the finite element analysis effort such that timely results may be obtained in June 2007.

III. Proposed Revisions to Standard Review Plan (SRP) Sections (Open)

[Note: Mr. Ralph Caruso was the Designated Federal Official for this portion of the meeting.]

The Committee met with representatives of the NRC staff to discuss proposed modifications to SRP Section 15.0, "Introduction - Transient and Accident Analyses," and SRP Section 15.9, "BWR Stability." SRP Section 15.0 was revised from the 1996 version to clarify event categories and acceptance criteria based on the current regulations. The changes are meant to cover new reactor designs. Events are now classified into Anticipated Operational Occurrences (AOOs) and postulated accidents. The SRP Section stipulates that it is necessary to demonstrate that AOOs will not escalate into postulated accidents. Anticipated transient without scram (ATWS) is put into a separate class.

SRP Section 15.9 is a new Section and incorporates information that was previously included in SRP Section 4.4. It provides guidance to reviewers on reactor stability issues and ensures compliance with the requirements in General Design Criteria 10 and 12. It applies to both new and existing plants. SRP Section 15.9 provides guidance on acceptance criteria for detection and suppression systems and generic stability problems. The guidance focuses on dealing with density wave oscillations, but reviewers are also expected to ensure that other types of oscillations have been suppressed or are not possible.

IV. Final Results of the Chemical Effects Head Loss Tests Related to the Resolution of the PWR Sump Performance Issues (Open)

[Note: Mr. Ralph Caruso was the Designated Federal Official for this portion of the meeting.]

The Committee met with representatives of the NRC staff to discuss the final results of the chemical effects testing that has been performed to support resolution of GSI-191, PWR Sump Performance. The presentations focused on particular tests investigating the effects of an industry-proposed surrogate debris material, as well as the effects of proposed changes to the

chemical buffer material in the containment sump. The NRC staff also described a peer review that was performed to evaluate the overall program and recommend improvements and additional technical issues for consideration. The Committee members provided the staff with several suggestions for further use of the peer-review studies. The staff also presented the results of efforts to improve models of the head loss through debris-laden PWR sump screens, based on experiments performed by Pacific Northwest National Laboratory.

V. Technology-Neutral Licensing Framework and Related Matters (Open)

[Note: Mr. David C. Fischer was the Designated Federal Official for this portion of the meeting.]

The staff described the framework, or process, for developing new reactor licensing requirements documented in draft NUREG-1860 and published as an Advance Notice of Proposed Rulemaking (ANPR). The framework provides guidance and criteria for creating a comprehensive set of risk-derived and performance-based requirements that can be either technology-neutral or technology-specific. The ANPR sought stakeholder input on several technical and policy issues (e.g., level of safety, integrated risk, containment versus confinement). Public comments were generally supportive of the framework, but stakeholders did not want this work to encumber new reactor licensing activities. There were mixed stakeholder views with regard to whether and when the staff should be pursuing technology-neutral versus technology-specific requirements and guidance. The Committee members commented that the framework represented a major advancement in the development of a coherent risk-informed approach to develop regulatory requirements for new reactors.

VI. Proposed Revisions to Regulatory Guides and Standard Review Plan Sections in Support of New Reactor Licensing (Open)

[Note: Mr. David C. Fischer was the Designated Federal Official for this portion of the meeting.]

The Committee discussed “high-priority” SRP Sections that are being revised or developed in support of new reactor licensing. The Committee noted that it is awaiting receipt of additional high-priority SRP Sections from the staff.

VII. Safeguards and Security Matters (Closed)

[Note: Mr. Eric A. Thornsby was the Designated Federal Official for this portion of the meeting.]

The Committee met with representatives of the NRC staff to discuss its work to address a recommendation included in the April 24, 2006 ACRS report on ongoing security-related activities. The staff described the status of an options paper submitted to the Commission, the key information gathered to support this work, and plans for additional research.

VIII. Executive Session (Open)

[Note: Mr. Frank P. Gillespie was the Designated Federal Official for this portion of the meeting.]

A. RECONCILIATION OF ACRS COMMENTS AND RECOMMENDATIONS/EDO COMMITMENTS

The Committee discussed the response from the NRC Executive Director of Operations (EDO) to ACRS comments and recommendations included in recent ACRS reports:

B. Report on the Meeting of the Planning and Procedures Subcommittee Held on March 7, 2007

The ACRS Subcommittee on Planning and Procedures held a meeting on March 7, 2007, in Room T-2B1, Two White Flint North Building, Rockville, Maryland. The purpose of the meeting was to discuss matters related to the conduct of ACRS business. The meeting was convened at 8:30 am and adjourned at 9:35 am.

1. Review of the Member Assignments and Priorities for ACRS Reports and Letters for the March ACRS meeting

Reports and letters that would benefit from additional consideration at a future ACRS meeting were discussed.

2. Anticipated Workload for ACRS Members

The anticipated workload for ACRS members through May 2007 was discussed. The objectives are to:

- Review the reasons for the scheduling of each activity and the expected work product and to make changes, as appropriate
- Manage the members' workload for these meetings
- Plan and schedule items for ACRS discussion of topical and emerging issues

During this session, the Subcommittee also discussed and developed recommendations on items requiring Committee action.

3. Continuing Resolution for FY2007

During the February 2007 ACRS meeting, the Committee was informed of the impact of Continuing Resolution on ACRS/ACNW activities, such as travel, training, A-76 contract, visit to the San Onofre Nuclear Plant and meeting with the regional administrator. On February 14, 2007, the Senate passed the Joint Resolution, which includes \$821 million for the Agency to accomplish its mission in FY2007. The President signed this measure on February 15, 2007. Since the Agency has sufficient funds to perform its functions in FY2007, the restrictions on ACRS/ACNW activities have been lifted.

During the February meeting, the members were informed of the temporary cancellation of the plant visit to San Onofre because of the Continuing Resolution. Since adequate funding is now available, arrangements are being made to visit the San Onofre Plant in June 2007. The members should select the dates for this plant visit.

4. Interview of Candidates for ACRS Membership

In February, the ACRS Member Candidate Screening Panel and the members interviewed three candidates with digital I&C experience and one candidate with experience in plant operations. Another four candidates were interviewed during the March ACRS meeting. Additional candidates will be scheduled for interview during the April 5-7, 2007 ACRS meeting.

5. Assessment of the Quality of Selected NRC Research Projects

During its December 2006 and February 2007 meetings, the Committee selected the following three projects for quality assessment in FY2007:

- Associated Circuit Fire Testing (CAROLFIRE) - [Banerjee (Chair), Corradini, Sieber]
- Fatigue Crack Flaw Tolerance in Nuclear Plant Piping [Shack (Chair), Armijo, Abdel-Khalik]
- Technical Review of Online Monitoring Techniques for Performance Assessment [Maynard, (Chair), Apostolakis, Bonaca]

The schedule for completing this assessment was discussed.

6. Comments by Sandia National Laboratories on Buckling Limits for the Oyster Creek Drywell

Sandia National Laboratories (SNL), under a contract with the NRC, performed a structural integrity analysis of the degraded drywell containment at the Oyster Creek Nuclear Generating Station. The results of this analysis were presented to the ACRS, both by the staff and SNL, during its review of the Oyster Creek license renewal application. In an e-mail to the staff dated February 9, 2007, Mr. Hossheimer, SNL, states that:

During the February 1, 2007 ACRS meeting, the staff stated that SNL analysis "did not include the effect of hoop tension in determining the minimum shell thickness." The implication was that SNL should have used an increased capacity factor in determining the minimum shell thickness.

Although SNL did not apply the increase in the capacity reduction factor due to the presence of hoop tension (resulting from internal pressure) allowed by the ASME Code Case N-284, the theoretical buckling load determined by the linear elastic finite element analysis, to which the capacity reduction factor is applied, does, in fact, explicitly account for the hoop tension which develops in the shell.

SNL does not agree that the application of the increased capacity reduction factor to its analysis, as presented to the ACRS by both the licensee and the staff, to determine the minimum uniform thickness in the sandbed region is correct.

In its February 8, 2007 report on the Oyster Creek license renewal application, the Committee stated, "The staff reaffirmed its position that the use of the increased capacity factor is appropriate for the analysis of the OCGS drywell shell. We concur with its position." Neither the staff nor SNL brought the difference of opinion to the ACRS during its review of the Oyster Creek license renewal application. Therefore, the ACRS statement is based on the information presented by the staff and the applicant during the meeting.

The Committee discussed these issues.

7. State of New Jersey Department of Environmental Protection's Comments on Oyster Creek License Renewal Application

In a letter dated January 31, 2007 to Dr. P. T. Kuo, NRR, and a copy to the ACRS Chairman, the Department of Environmental Protection, State of New Jersey, states that, based on the discussions held with the NRC staff and AmerGen during the January 18, 2007 meeting, the ACRS Subcommittee members recognized the analysis performed by SNL to determine the minimum shell thickness as being more accurate than the GE analysis performed for Oyster Creek in 1991. Accordingly, it is the State of New Jersey Department of Environmental Protection's position that the NRC should require the Oyster Creek licensee to submit equally or more accurate analyses of the drywell to justify both the current continuing operation of Oyster Creek and the proposed 20-year period of extended plant operation. Furthermore, the NRC should withhold a final decision on Oyster Creek's license renewal application pending NRC staff review and approval of such analysis and any associated aging management changes.

The Department of Environmental Protection of the State of New Jersey has a similar position as that of the ACRS. In its February 8, 2007 report, the Committee recommended that the staff add a license condition to ensure that the applicant fulfills its commitment to perform a 3-D finite-element analysis of the drywell shell prior to entering the period of operation.

On March 2, 2007, Dr. Kuo responded to the above letter.

These issues were discussed.

8. Proposed Topics for Meeting with the NRC Commissioners

The ACRS is scheduled to meet with the NRC Commissioners between 1:30 and 3:00 p.m. on Thursday, June 7, 2007. Topics proposed by the ACRS staff and agreed to by the Planning and Procedures Subcommittee are as follows:

1. Overview
 - Future Plant Design Activities
 - Dissimilar Metal Weld Issues
 - Future ACRS Activities
2. Risk-Informing 10 CFR 50.46
3. Framework for Future Plant Licensing
4. Digital I&C Activities
5. License Renewal/Extended Power Uprate
6. Human Reliability Analysis Models

The Committee should approve a list of topics during the March meeting.

9) ESBWR Design Clarification Review

The staff states that it has made significant progress to date on the ESBWR design certification review with the issuance of over 2800 Requests for Additional Information (RAIs), preliminary SER inputs, and in many cases SER with open item inputs. Because of the large number of open items that would be included in a staff SER with open items scheduled to be issued in October 2007, and the resultant delay in identifying open items to GE, the staff is entertaining the following proposal from GE.

GE is working towards submitting of Revision 3 of the ESBWR design control document (DCD) on February 22, 2007. This revision will purportedly identify additional design and configuration changes that result in improved plant safety margins and operational flexibility, and address NRC staff technical issues. In consideration of the number of SER open items that could result from these recently identified changes to the DCD, GE is proposing an adjustment to the NRC staff's review process "to gain mutual efficiencies." GE proposes frequent interactions with the staff to resolve open issues prior to issuance of the staff's initial SER. GE hopes to reduce the need for issuing multiple supplements to the SER to support closure of identified open items and COL action items. Open items would be identified and transmitted to GE in segments, likely on a DCD Chapter basis, to allow for their timely resolution. In this manner, the NRC staff's initial SER can essentially be a final SER that would establish the basis for initiating rulemaking. GE's schedule targets a final design certification rule by December 2009.

As a result of the aforementioned approach, the staff no longer plans to issue an SER with open items in October 2007. Rather, the staff plans on issuing a final, or near final, SER on the ESBWR design certification application in November 2008. Between now and then, the staff will be sending open item letters on a DCD chapter-by-chapter basis to GE. The staff has agreed to send these open item letters to the ACRS for review. The ACRS member assigned to review that chapter would then be asked to review the open item letter, and the associated draft SER chapter, to determine/recommend if an

ACRS Subcommittee meeting or full Committee session is warranted. If the Committee decides to review the chapter at that time, it could then write an interim letter to document its comments and/or concerns. This way, the Committee would not have to wait for the receipt of the draft final SER before it begins its review of the technical issues.

It should be noted that the ACRS adopted a similar approach in its review of the ABWR design certification application.

10. Reorganization of the ACRS/ACNW Office

A proposed reorganization of the ACRS/ACNW Office was discussed. Subsequent to the Committee's endorsement, the proposed reorganization will be sent to the Commission for approval.

11. Member Issue

On February 20, 2007, Dr. Sanjoy Banerjee received an email from Ms. Carmen DeLong, a program manager for Pro2Serve Professional Project Services, Inc. requesting his comments on Chapter 15 of DG 1145 (Combined License Applications for Nuclear Power Plants) and expressing concerns regarding the staff's review of thermal-hydraulic codes. Ms. DeLong has been informed that it would be inappropriate for Dr Banerjee to provide his individual views on an issue reviewed by the Committee and that her other concerns would best be addressed by the NRC staff.

12. Quadripartite Working Group Meeting (FPG/MA)

At the October 2006 Quadripartite Meeting, several participants suggested that Working Groups (WGs) be established to discuss specific topics in more detail prior to scheduling these topics for discussion at the next Quadripartite Meeting, which is scheduled to be held in France in 2010.

Germany's Reaktor-Sicherheitskommission (RSK) has offered to host the first Quadripartite WG meeting in Germany in September/October 2007. RSK would like to finalize the topic for the WG.

France's Groupe Permanent pour les Réacteurs nucléaires (GPR) has suggested the following two topics:

- EPR safety assessment
- High burn-up fuel

and Germany's RSK has suggested:

- Reduced leak assumptions (break concept)
- Emergency core cooling

We haven't heard from Japan's Nuclear Safety Commission (NSC) yet.

C. Future Meeting Agenda

Appendix IV summarizes the proposed items endorsed by the Committee for the **541st** ACRS Meeting, **April 5 - 7, 2007**.

The **540h** ACRS meeting was adjourned at **6:30 PM, March 9, 2007**.