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May 3-5, 2007

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REPORTS:

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

1. Development of an Integrated Long-Term Regulatory Research Plan, **dated May 16, 2007**
2. Draft Commission Paper on Staff Plan Regarding a Risk-Informed and Performance-Based Revision to 10 CFR Part 50, **dated May 16, 2007**
3. Activities Related to Digital Instrumentation and Control Systems, **dated May 18, 2007**
4. Proposed Technical Basis for the Revision to 10 CFR 50.46 LOCA Embrittlement Criteria for Fuel Cladding Materials, **dated May 22, 2007**

MEMORANDA:

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

1. Draft Regulatory Guide DG-1132, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants," **dated May 8, 2007**
2. Draft Regulatory Guide DG-1173, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," **dated May 8, 2007**

APPENDICES

- I. *Federal Register Notice*
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- IV. Future Agenda and Subcommittee Activities
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MINUTES OF THE 542nd MEETING OF THE
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
May 3 - 5, 2007
ROCKVILLE, MARYLAND

The **542nd** meeting of the Advisory Committee on Reactor Safeguards (ACRS) was held in Conference Room 2B3, Two White Flint North Building, Rockville, Maryland, on **May 3 - 5, 2007**. Notice of this meeting was published in the *Federal Register* on **April 18, 2007** (72 FR **13312**) (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. Said Abdel-Khalik, Dr. George E. Apostolakis, Dr. Sanjoy Banerjee, Dr. Michael Corradini, Dr. Thomas S. Kress, Mr. Otto L. Maynard, Dr. Dana A. Powers and Dr. Graham B. Wallis. For a list of other attendees, see Appendix III.

I. Chairman's Report (Open)

[Note: Mr. Sam Duraiswamy 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. Digital Instrumentation and Control (I&C) System Matters

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

The Committee met with representatives of the NRC staff and the Nuclear Energy Institute (NEI) to discuss the industry and NRC staff activities for addressing digital I&C issues. NEI representatives discussed ongoing short-term and long-term industry activities on digital I&C and described frequent meetings with the digital I&C Steering Committee of the NRC to prioritize needs and resources. In general, NEI agrees with the NRC approach to addressing digital I&C issues, but considers implementation of analog backups to digital I&C to be unnecessary and overly complicated for providing necessary levels of diversity and defense in depth (D3). NEI is working with the Electric Power Research Institute (EPRI) to develop technical papers on methods for ensuring D3.

The staff described digital I&C Steering Committee activities, D3 research, and risk-informing reviews of digital I&C systems. The staff's draft project plan identifies issues and describes specific Task Working Group activities associated with cyber security, highly integrated control room communications and human factors, D3, risk-informed reviews of digital I&C systems, and licensing process issues. The development of guidance for adequate levels of D3 is the most urgent need to support new reactor licensing in the near term. The staff plans to address several issues associated with D3 including defining adequate diversity, criteria for manual actions, and guidance on common-cause effects. Since the current guidance uses a deterministic approach for licensing a digital system, the staff is identifying challenges with implementing risk-informed methods such as modeling issues and development of a review process consistent with current regulations.

III. Commission Paper on Staff's Recommendation Regarding a Risk-Informed and Performance-Based Revision to 10 CFR Part 50

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

The Committee met with representatives of the NRC staff to discuss the staff's proposed recommendation to the Commission regarding the development of a risk-informed and performance-based revision to 10 CFR Part 50 for future plant licensing (i.e., a new 10 CFR Part 53). The staff proposes to defer this rulemaking until the licensing strategy for the Next Generation Nuclear Plant (NGNP) is completed. This recommendation is based on: stakeholder comments to "test" the draft requirements before codifying them; the near term impact on design certifications and combined license applications; the potential impact on NGNP licensing strategy development; and the potential impact on longer-term projects such as the Global Nuclear Energy Partnership. The staff noted that the current regulatory structure contains requirements that may not be applicable to advanced reactor designs. Advanced reactors also have design and operational issues different from light-water reactors (LWRs). The discussion covered certain advanced reactor policy issues raised in the advance notice of proposed rulemaking (ANPR) issued in May of 2006, a summary of the public comments received on the ANPR and policy issues, as well as a high-level discussion of the technology-neutral regulatory framework.

The staff stated that stakeholders generally supported the development of risk-informed requirements for future reactor designs but did not want it to disrupt near-term plans for LWR design certifications and combined license applications or ongoing risk-informed initiatives. Stakeholders suggested that the draft requirements derived from the framework be compared to requirements derived from 10 CFR Parts 50 and 52. The framework could then be adjusted based on this comparison before initiating rulemaking. The Committee members discussed the best way to test the framework (i.e., on a LWR or a non-LWR).

Policy issues discussed during the meeting included: level-of-safety and integrated risk; defense in depth; single failure criterion; containment performance standards; and the integration of safety, security, and emergency preparedness. The staff summarized stakeholders' comments associated with each issue. The staff indicated that it planned to publish NUREG-1860, "Framework for Development of a Risk-Informed, Performance-Based Alternative to 10 CFR Part 50," in the summer of 2007.

IV. Status of the Development of an Integrated Long-Term Regulatory Research Plan

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

The Committee met with representatives of the NRC staff regarding the staff's activities associated with the development of an integrated long-term regulatory research plan. The staff described the objectives of the agency-wide, long-term regulatory research plan as well as a summary of proposed activities for Fiscal Year 2009. The staff noted that the focus of the long-term research plan is on anticipated future needs which are not currently identified in other NRC planning documents. The staff identified four broad areas of long-term research activities: research to support licensing of nuclear facilities developed for the Department of Energy's Global Nuclear Energy Partnership; research to support reactor license renewal beyond 60 years; research activities associated with possible development of experimental facilities; and cross-cutting and emergent technologies. The staff also noted that the long-term regulatory research is a living document and will be updated periodically. The Committee members commented that the focus of the work proposed by the staff is different from that emphasized for long-term research in recent ACRS biennial reports on Review and Evaluation of the NRC Safety Research Program. The Committee members also commented on several of the specific long-term research projects.

V. ACRS Members' Issues Associated with the Technology-Neutral Framework for Future Plant Licensing

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

The Committee had a discussion of individual ACRS member's issues associated with the technology-neutral regulatory framework for future plant licensing. The members' issues were divided into the following categories: Design Requirements vs. Site Requirements; Technical Issues; Policy Issues; and Philosophical Issues. The Committee has not yet reached a consensus on issues such as: preserving the concept of design-basis or licensing-basis events; separating design acceptance from site suitability; using the quantitative health objectives as the high-level risk acceptance criteria; and the need for a complimentary cumulative distribution function acceptance curve. There was general agreement among Committee members that draft NUREG-1860 was not as clear and concise as an effective framework document should be.

VI. 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:

- The Committee considered the EDO's response of April 24, 2007, to comments and recommendations included in the March 22, 2007 ACRS report regarding the development of the TRACE thermal-hydraulic system analysis code. The Committee decided that it was satisfied with the EDO's response.
- The Committee considered the EDO's response of April 23, 2007, to comments and recommendations included in the March 22, 2007 ACRS letter regarding the proposed NRC staff and industry activities for addressing dissimilar metal weld issues resulting from the Wolf Creek pressurizer weld inspection. The Committee decided that it was satisfied with the EDO's response.

The staff committed to keep the Committee informed of this issue as the advanced finite element analyses being performed by industry and the staff proceed.

- B. Report on the Meeting of the Planning and Procedure Subcommittee Held on May 2, 2007

Review of the Member Assignments and Priorities for ACRS Reports and Letters for the May ACRS meeting

Member assignments and priorities for ACRS reports and letters for the May ACRS meeting were discussed. Reports and letters that would benefit from additional consideration at a future ACRS meeting were also discussed.

Anticipated Workload for ACRS Members

The anticipated workload for ACRS members through July 2007 were 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.

Recommendation to the Commission for Appointment of New Members

On April 23, 2007, the ACRS Member Candidate Screening Panel sent a list of candidates to the Commission, recommending appointment of three members to the ACRS. We are awaiting Commission decision.

Slides for Meeting with the NRC Commissioners

The ACRS met with the NRC Commissioners from 1:30 and 3:30 p.m. on Thursday, June 7, 2007. The following topics have been approved by the Commission. During the April meeting, cognizant ACRS members and the staff were asked to prepare presentation slides for consideration by the Committee during the May meeting:

1. Overview (WJS/SD)
 - Accomplishments
 - Future Plant Design Activities
 - Dissimilar Metal Weld Issues
 - Ongoing/Future ACRS Activities
2. Framework for Future Plant Licensing (TSK/DCF)
3. Digital I&C Activities (GEA/CGH)
4. License Renewal/Extended Power Uprates (MVB/MAJ/RC)
5. Human Reliability Analysis Models (GEA/HPN)

6. Staff Report on the Status of the 10 CFR 50.46 Rulemaking (**DELETED**)
(WJS/CGH)

Item 6, Staff Report on the Status of the 10 CFR 50.46 Rulemaking, which was scheduled for discussion during the May ACRS meeting, has been postponed to a future meeting due to the unavailability of the Staff's Report. Office of SECY was requested to find out whether the Commission would like to remove this topic from the above list. On April 26, 2007, Office of SECY informed us that the Commission has no objection to deleting Item 6.

Visit to San Onofre Nuclear Plant and Meeting With Region IV Administrator

The following members have agreed to visit San Onofre Nuclear Plant and meet with the Region IV Administrator during the week of August 13:

Apostolakis	Corradini
Armijo	Maynard
Banerjee	Shack
Bonaca	Sieber
Abdel-Khalik	Wallis

A list of questions considered by the Committee at the April meeting had been sent to the Regional Administrator and the licensee. An agenda is being prepared and will be provided to the members during the June meeting. In addition, details of the travel arrangements will be provided in June.

Visit to the Susquehanna Nuclear Plant

During the April meeting, the following members have agreed to visit the Susquehanna Nuclear Plant during the week of August 20, specifically to observe the simulation of the plant response to transients or certain events and gather information for use in the ACRS review of the Susquehanna application for an extended power uprate.

Because of some prescheduled activities on the simulator for the week of August 20, the licensee will not be able to accommodate the members' visit during this week. The Committee needs to propose alternative dates. The following members have agreed to visit the Susquehanna Plant:

Banerjee	Armijo
Abdel-Khalik	Bonaca
Shack	Wallis

Vice Chairman to the ACRS and Member-at-Large to the Planning and Procedures Subcommittee

Mr. Sieber, ACRS Vice Chairman, underwent surgery on March 1, 2007. It is not clear whether or when he will be back on the Committee.

Section 8.2 of the ACRS Bylaws state:

In the event the Vice Chairman is unable or unavailable to carry out his duties for a limited period (two months or less), the Chairman may appoint another member to act as Vice Chairman.

In anticipation of Mr. Sieber returning to the Committee within two months, the Chairman did not appoint another member to act as Vice Chairman.

Section 8.3 of the Bylaws state that:

The line of succession for Committee Officers is Chairman, Vice Chairman, and Member-at-Large. If either of the first two is no longer available to continue to serve, those next in line will move up in the succession. A special election will then be held to fill the resulting vacancy.

Accordingly, Dr. Bonaca, current Member-at-Large, will become the Vice Chairman and a special election will be held to elect a new Member-at-Large in June.

Proposed Revisions to ACRS Subcommittee Structure

A summary of the proposed revisions to the ACRS Subcommittee structure is provided below.

- EPR Combined License Application Subcommittee has been renamed as EPR Subcommittee, and ESBWR Combined License Application Subcommittee has been renamed as ESBWR Subcommittee.

These Subcommittees will be responsible for performing reviews of pre-application, design certification, and COL applications.

- Dr. Corradini will Chair the ESBWR Subcommittee. The current Chairman, Mr. Maynard, will remain as a member. Dr. Corradini will also Chair the Future Plant Designs Subcommittee effective September 1, 2007.
- A new Subcommittee on U.S. APWR has been established. This Subcommittee will be Chaired by Mr. Maynard.

Upon Commission approval of new members, another revision to the Subcommittee structure will be issued which will reflect changes in member assignments and staff assignments, as well as changes to the Subcommittee tasks.

Subject to the Committee's endorsement of these changes, the revised Subcommittee structure will become effective on May 7, 2007.

In view of the departure of some ACRS staff engineers, temporary reassignments have been made.

Overview of the AP1000 Design

The AP1000 design was certified by the NRC in September 2004. The AP1000 design is expected to be referenced in 6 COL applications (4 in the 1st quarter of FY 08).

The staff has adopted a design-centered review approach (DCRA). This approach will use, to the maximum extent practicable, a "one issue, one review, one position" strategy in order to optimize the review effort, the resources needed to perform these reviews, and the review schedules. Specifically, the staff will conduct one review for each issue associated with a particular design, reach a decision on each issue, and if possible rely on that decision in reviewing subsequent applications. In order for the DCRA to be fully effective, it is important that applicants achieve a consistent level of standardization.

Last summer, the U.S. Department of Energy (DOE) offered one-day familiarization sessions on the Westinghouse AP 1000 design and the GE ESBWR design. Committee members, especially those who were not involved in the AP1000 design certification, may be interested in receiving an overview of the AP1000 design.

Quadripartite Working Group Meeting

Germany's Reaktor-Sicherheitskommission (RSK) will host the first Quadripartite Working Group (WG) meeting on the topic of "Sump Screen Blockage" on October 17-18, 2007, in Erlangen, Germany. A tentative agenda is attached. During the April meeting, the Committee authorized Dr. Banerjee, Dr. Bonaca, Dr. Abdel-Khalik, and Dr. Wallis to attend this WG meeting.

The topic for the second WG meeting in 2008 is "EPR Safety Assessment/Future Reactor Licensing." The location (U.S. or France) of this meeting has not been determined.

France's Groupe Permanent pour les Reacteurs (GPR) will host the next Quadripartite Meeting in 2010. Japan's Nuclear Safety Commission (NSC) has offered to host the third WG Meeting in 2009. The topic for this WG meeting will be proposed later.

The NRC staff expects to receive the EPR design certification application in December 2007. The ACRS review of the Draft Safety Evaluation Report associated with the EPR design certification application is expected to begin in late 2008 or early 2009. As a result, holding the second WG meeting in France seems more appropriate.

IAEA Technical Meeting on Common Cause Failures in Digital I&C Systems of Nuclear Power Plants

A technical meeting organized by the International Atomic Energy Agency (IAEA), in cooperation with the NRC, DOE, EPRI, and NEI, is scheduled to be held at the Hyatt Regency Bethesda on June 19 - 21, 2007. This meeting will provide a forum for international experts on digital I&C to present and discuss experiences with methods

and techniques to cope with common cause failures in digital I&C systems in nuclear power plants. The meeting is intended for I&C experts and managers from power utilities, vendor companies licensing bodies, research organizations and academic institutions. The meeting will provide both experiences from already installed systems as well as descriptions of new and planned I&C systems. Further information on the meeting is provided in the attached information sheets.

Commission Meeting on the Use of Digital Instrumentation & Control System Matters

A Commission meeting is tentatively scheduled for Wednesday, July 18, 2007 between 1:00 - 4:00 p.m. to discuss the use of digital I&C systems. In addition to the NRC staff, several stakeholders, including NEI, EPRI, and North American Electric Reliability Corporation are scheduled to provide presentations. As instructed by the NRC Chairman, Office of SECY has invited a member of the ACRS to participate in this meeting. A preliminary schedule for this meeting is attached.

C. Future Meeting Agenda

Appendix IV summarizes the proposed items endorsed by the Committee for the **543rd** ACRS Meeting, **June 6 - 8, 2007**.

The **542nd** ACRC meeting was adjourned at **1:00 PM, May 5, 2007**.