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

July 1, 2011

MEMORANDUM TO: ACRS Members

FROM: Weidong Wang, Senior Staff Engineer ***/RA/***
Reactor Safety Branch B, ACRS

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS SUBCOMMITTEE ON THE AP1000 REACTOR, OCTOBER 5, 2010, ROCKVILLE, MARYLAND

The minutes of the subject meeting were certified on December 16, 2010, as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As Stated

cc: w/o Attachment: E. Hackett
Y, Dias-Sanabria

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

MEMORANDUM TO: Weidong Wang, Senior Staff Engineer
Technical Support Branch, ACRS

FROM: Harold B. Ray, Chairman
ACRS AP1000 Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS SUBCOMMITTEE ON THE AP1000 REACTOR, OCTOBER 5, 2010, ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting held on October 5, 2010, are an accurate record of the proceedings.

/RA/

December 16, 2010

Harold B. Ray, Chairman
ACRS AP1000 Subcommittee

Date

Certified on: December 16, 2010
Certified by: Harold Ray

REVISION 17 TO AP1000 DESIGN CONTROL DOCUMENT APPLICATION

October 5, 2010
ROCKVILLE, MARYLAND

INTRODUCTION

The Advisory Committee on Reactor Safeguards (ACRS) Subcommittee on the Westinghouse Electric Company's AP1000 advanced pressurized water reactor (PWR) design met in Room T-2B1 at the Headquarters of the U.S. Nuclear Regulatory Commission (NRC), located at 11545 Rockville Pike, Rockville, Maryland, on October 5, 2010. The purpose of this meeting was to review select chapters of the Revision 17 to AP1000 DCD and its associated Advanced Final Safety Evaluation Report (FSER). The Subcommittee was briefed by, and held discussions with representatives of Westinghouse Electric Company (WEC) on the AP1000 DCD Amendment and the U.S. Nuclear Regulatory Commission (NRC) on the Advanced FSERs. As part of the respective review processes, NRC's regulations under 10 CFR Part 52 direct the staff to consult with the ACRS on safety issues before any reactor design can be certified or any NRC operating license can be approved.

The staff's Advanced FSER was organized based on the various chapters found in NUREG-0800 – NRC's "Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition." To this end, the Subcommittee planned to gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee of the ACRS at a later date. This was the ninth Subcommittee meeting on the AP1000 design.

The Chairman for this ACRS Subcommittee was Mr. Harold Ray. Mr. Weidong Wang was the cognizant ACRS staff engineer for this topic and served as the Designated Federal Official for this meeting. Peter Wen, an ACRS staff engineer, supported this one-day meeting as well. Part of the meeting was closed to public attendance and part of the meeting was opened.

ATTENDEES

ACRS

H. Ray, Subcommittee Chairman	S. Banerjee, Member	M. Corradini, Member

M. Ryan, Member	B. Shack, Member	G. Wallis, Invited ACRS Consultant
T. Kress, Invited ACRS Consultant	W. Wang, ACRS Staff	P. Wen, ACRS Staff

The NRC Staff

E. McKenna	J. Donaghue	J. McKirgan
Y. Hsii	G. Makar	M. Hayes
C. Ashley	C. Jackson	J. Strnisha
D. Terao	M. Hart	E. Giger
M. Norrato	I. Berrios	J. Carneal
J. Cruz	S. Lu	J. Honcharik
P. Clark		

The other Individuals and their affiliations attending this meeting are listed in the sign-in sheets in Attachment 1.

SCHEDULED PRESENTATIONS

The detailed agenda identifying the specific presentation topics comprising this meeting can be found in Attachment 2. Both during and following the scheduled presentations, the speakers responded to specific questions and comments from the ACRS Subcommittee members. The scope of the questions, comments, and the speaker's responses have been captured in the verbatim meeting transcript. As a result of questions and comments from the Members and responses from the speakers, follow-up actions were identified for further discussion at subsequent subcommittee meetings. These follow-up actions are tracked by the ACRS staff. Topics on Chapter 15 and Gas Accumulation and Containment Vacuum Breakers were listed on the meeting Agenda. However, due to the time limitation, these topics were not presented during this meeting. The topics presented were:

1) AP1000 Long-Term Cooling – GSI 191 Resolution
2) Control Room Habitability Systems

ACRS Subcommittee meeting transcripts can be found at the following NRC Internet website location*:* *http://www.nrc.gov/ reading-rm/doc-collections/acrs/tr/subcommittee/*.

Opening Remarks

Subcommittee Chairman Ray made the opening remarks. He stated that this AP1000 Subcommittee meeting would continue to review the Safety Evaluation Reports on Revision 17 to the AP1000 DCD. The review topics included Chapter 6, which covers Generic Safety Issue-191 and Action Items from the past AP1000 Subcommittee meetings. ACRS would hear presentations from the DCD applicant Westinghouse and the NRC Staff. The ACRS Subcommittee received no written comments or requests for time to make oral statements from members of the public regarding this meeting. Presentations on GSI-191 would be closed in order to discuss information that is proprietary to the applicant and its contractors pursuant to 5 U.S.C. 552(b), (c), (3), and (4).

Following the opening statement by the Subcommittee chairman, the applicant and the NRC staff made presentations. The briefing slides with non-proprietary information can be found in Attachment 3.

Key points and Follow-Up Actions

WEC presented the resolution of issues associated with debris generation, which is related to Generic Safety Issue (GSI)-191, "Assessment of Debris Accumulation on PWR Sump Performance." WEC described the differences between the AP1000 design and generic PWR designs. The AP1000 design has greatly reduced post loss of coolant accident (LOCA) debris sources. Since the AP1000 recirculation flow occurs by natural circulation with no active pumps, the recirculation has slow flow characteristics. Some possible LOCA locations will become flooded, allowing debris to enter the reactor coolant system without passing through screens. WEC performed analyses using the WCOBRA/TRAC code to set safety limits for the core cooling. Members questioned the oscillatory flow behavior observed in these calculations. WEC presented fuel assembly test results that demonstrate that the AP1000 design meets safety limits derived from the WCOBRA/TRAC calculations. Members questioned the validity of these tests and the rationale for selecting the total amount of fiber. The staff's presentation summarized their evaluation approach for the AP1000 GSI-191 long-term core cooling. The staff concluded that the fuel assembly head loss tests performed with design basis debris loading met the acceptance criteria with considerable margin and that there is reasonable assurance that, even in the presence of debris, adequate core cooling is maintained after the LOCA.

As a result of the discussion, Action Items numbered 35, 36, 38, and 39 in the Action item table were closed. The meeting produced new action items as:

Action Item 68

(1) What are the lowest flows calculated by COBRA/TRAC for various accident scenarios using the same debris loading as is used for the DVI break calculations?
(2) How do numerical (nodalization and time-step) convergence tests affect the oscillations seen in the COBRA/TRAC calculations?
(3) Do DEDVIGB breaks lead to the lowest driving head conditions? Are there other accident scenarios (e.g., some cold leg breaks) that lead to lower driving heads due to incomplete filling of the downcomer?
(4) If the bed resistance is made a function of velocity as seen in the experiments, how are the oscillations and the average flows and pressure losses affected?

(5) If the bed resistance is made a function of flow rate through the debris beds formed, then do these effects change the worst-case scenarios? Does such a flow-dependent bed resistance parameterization lead to lower flows than would be calculated with a constant bed resistance for the worst-case scenarios?

Action Item 69

(1) What is the margin between the worst case COBRA/TRAC calculations presented and the flow that would lead to dry-out? In other words, how much would the debris bed loss factor have to be increased in order to lead to dry-out?
(2) At what quality would dry-out be expected at the decay heat levels used to generate the table of COBRA/TRAC results presented by the staff?
(3) What is the low-pressure, low-flow CHF correlation used in COBRA/TRAC?

Action Item 70

(1) What happens to boron concentration levels and deposition in the event of dry-out (Addressed in November Full Committee meeting. Need explicit reference.)
(2) What are the conditions in outlet quality and flow rate at which boron precipitation becomes a concern?

Action Item 71

How sensitive are the debris bed head losses to:
(1) Flow rate
(2) Fiber characteristics
(3) Fiber loading
(4) Chemical loading
(5) Testing protocols

A table with complete action items is in the Attachment 4.

Attachments

1. Sign-In Sheets
2. Meeting Agenda
3. Presentation Slides from Open Sessions
4. ACRS AP1000 Subcommittee Action Items Table