

September 26, 2003

APPLICANT: Westinghouse Electric Company

PROJECT: AP1000 Standard Plant Design

SUBJECT: SUMMARY OF JULY 10-11, 2003, CATEGORY 1 MEETING WITH WESTINGHOUSE ELECTRIC COMPANY TO DISCUSS SPECIFIC OPEN ITEMS ASSOCIATED WITH THE AP1000 DESIGN CERTIFICATION REVIEW

On July 10-11, 2003, a public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of Westinghouse Electric Company (Westinghouse, the applicant), at NRC Headquarters in Rockville, MD. The purpose of this meeting was to discuss specific open items from the NRC staff's June 16, 2003, draft safety evaluation report (DSER) concerning the AP1000 design certification review. A list of meeting attendees on each day of the meeting is included as Attachment 1.

The NRC staff had extensive discussions with Westinghouse concerning the open items related to leak-before-break and emergency planning. A summary of these discussions is provided below.

Leak-Before-Break (LBB) Open Items: 3.6.3.4-1 and 3.6.3.4-2

The NRC staff opened the discussion by stating that the purpose of this meeting was a technical exchange on the LBB open items. Following this meeting, the NRC staff would consider the material presented by Westinghouse and, if necessary, have further interactions with the applicant to clarify any outstanding issues. Finally, the staff expects to issue a supplemental DSER for Open Item 3.6.3.4-2 concerning the applicant's LBB evaluation approach.

Both the NRC staff and Westinghouse made presentations concerning their position on the LBB open items. The NRC and Westinghouse presentations are included in Attachments 2 and 3 respectively. The NRC staff's presentation focused on a review of NRC regulations and application of LBB to the AP1000 design certification compared with previous design certifications. The NRC staff discussed the applicant's proposed approach to the AP1000 LBB application and stated that this approach was not consistent with the regulations or previous design certifications.

Westinghouse discussed their approach to the two LBB open items in their presentation. With regard to Open Item 3.6.3.4-1 concerning primary water stress corrosion cracking (PWSCC), Westinghouse proposed adding language to the AP1000 design control document (DCD) for the combined license applicant to commit to certain inspections adopted by existing operating reactor programs to address potential PWSCC in LBB piping systems. The NRC staff indicated that the concept was what the staff was looking for but requested Westinghouse to use wording closer to that in the RAI on the subject. The NRC staff also emphasized that a sensitivity study using trans-granular stress corrosion cracking (TGSCC) would be adequate to determine

whether LBB margins remain available under a potential stress corrosion cracking scenario. Westinghouse stated that they would evaluate this issue to determine the details involved in a sensitivity study.

With regard to Open Item 3.6.3.4-2, Westinghouse stated that the LBB piping systems for the AP1000 were the same that were designated for the AP600. Westinghouse stated that a comparison of lines qualified for LBB in the AP600 was provided to the NRC in a letter dated August 5, 2003 (ADAMS Accession Number ML022200455). The NRC staff stated that this letter did not provide sufficient information to conclude that the AP1000 LBB analyses performed for the AP600 were applicable to the AP1000 design certification. Westinghouse discussed the preliminary results of the LBB analysis for the direct vessel injection (DVI) "A" line. Preliminary bounding analysis curves for the DVI-A line are included in Attachment 3.

After extensive discussion, Westinghouse stated that they could perform an additional qualitative assessment of the AP1000 LBB piping systems, which would expand on their August 5, 2002, letter. The staff agreed to go back and consider the applicant's proposal. Both the NRC and Westinghouse agreed to have a conference call on these two DSER open items to discuss the NRC staff's concerns further.

Emergency Planning (EP) Open Items: 13.3-1, 13.3-2, and 14.3.2-12

The NRC staff provided further clarification regarding Open Items 13.3-1 and 13.3-2, which both dealt with the habitability of the technical support center (TSC). Open Item 13.3-1 concerned TSC habitability under accident conditions and the operation of the ventilation systems, and included the main control room (MCR) isolation triggering events. Open Item 13.3-2 addressed TSC evacuation, and relocation of TSC functions to the emergency operations facility (EOF). For Open Item 13.3-1, the staff needed further clarification regarding operation of the MCR and TSC ventilation systems, and requested that Westinghouse revise various AP1000 DCD sections to consistently reflect the MCR isolation triggering events. In addition, the staff needed clarification regarding whether the TSC habitability, i.e., compliance with General Design Criterion 19 (GDC 19), would be maintained for all eight AP1000 design basis accidents (DBAs). For Open Item 13.3-2, the staff disagreed with the relocation of TSC functions to the EOF, upon TSC evacuation.

Westinghouse provided clarification of the operation of the MCR and TSC ventilation systems, including the triggering events, and stated that they would revise the various sections of the DCD, which addressed the MCR isolation triggering events, in order to provide consistency. Westinghouse confirmed that all eight design basis accidents would not result in exceeding GDC 19 in the TSC. Westinghouse would also provide the results of a review of the TSC's DBA doses. Further, Westinghouse stated that in the event the TSC becomes uninhabitable, the TSC plant management function would be transferred to the control room, as reflected in the guidance in NUREG-0696, "Functional Criteria for Emergency Response Facilities," and that this had been reflected in a revision to the DCD.

The NRC staff also discussed Open Item 14.3.2-12. This open item dealt with Tier 1 ITAAC (Inspections, Tests, Analyses, and Acceptance Criteria) for the AP1000, and specifically, the criteria associated with TSC habitability. The staff's concern was that the ITAAC did not directly address TSC "habitability," and that the referenced acceptance criteria was not specific enough to provide for an adequate evaluation of system performance.

Westinghouse stated that the ITAAC would be revised to address TSC habitability, and that the specific ITAAC acceptance criteria would be more specifically defined.

Remaining Open Item Discussions

Attachment 4 contains a summary of actions agreed to by either the NRC staff or Westinghouse concerning the AP1000 draft safety evaluation report open items discussed during the public meeting. The Westinghouse responses to these open items can be found in the following letters:

<u>Date</u>	<u>ADAMS Accession Number</u>
June 23, 2003	ML031760598
June 24, 2003	ML031770042
July 1, 2003	ML031950553
July 3, 2003	ML031920200
July 7, 2003	ML031920218
July 8, 2003	ML031920121

These letters may be accessed through the ADAMS system. If you do not have access to ADAMS or if there are problems in accessing the letters located in ADAMS, contact the NRC Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737 or by e-mail to pdr@nrc.gov.

Please direct any inquires concerning this meeting to Joseph Colaccino at 301-415-2753, or jxc1@nrc.gov.

/RA/

Joseph Colaccino, Senior Project Manager
New Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 52-006

Attachments: 1. List of attendees
2. NRC Staff Presentation: AP1000 LBB Evaluation
3. Westinghouse presentation: AP1000 Draft Safety Evaluation Report LBB Open Items (ADAMS Accession No. ML032300182)
4. Summary of DSER Open Item Actions From July 10-11, 2003, Public Meeting

cc w/ atts: See next page

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cc w/ atts: See next page

ADAMS ACCESSION NUMBER: ML032320458-Pkg. *See previous concurrence

OFFICE	PM:RNRP	EMCB/DE*	EMEB/DE*	IEPB/DIPM
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DATE	9/17/2003	09/03/2003	09/03/2003	9/22/2003
OFFICE	IEPB/DIPM	RNRP	SC:RNRP	
NAME	DThatcher	JWilson	LDudes	
DATE	9/22/2003	9/22/2003	9/25/2003	

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NRC PUBLIC MEETING ATTENDANCE LIST
AP1000 DRAFT SAFETY EVALUATION REPORT
OPEN ITEM MEETING
JULY 10, 2003

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T. Hayes	Westinghouse Electric Corporation (Westinghouse)
W. Lapay	Westinghouse
D. Hutchings	Westinghouse
M. Corletti	Westinghouse
B. Musico	U. S. Nuclear Regulatory Commission (NRC)
T. Quay	NRC
E. Weiss	NRC
J. Starefos	NRC
J. Segala	NRC
J. Colaccino	NRC
C. Hinson	NRC
D. Barss	NRC
K. Williams	NRC
E. Fox	Public
M. Hart	NRC
J. Raval	NRC
N. Trehan	NRC
C. Reid	NRC
J. Wilson	NRC
G. Bagchi	NRC
H. Li	NRC
J. Bongarra	NRC
C. Graham	NRC
T. Cheng	NRC
F. Talbot	NRC
K. Coyne	NRC
D. Thatcher	NRC

NRC PUBLIC MEETING ATTENDANCE LIST (CONTINUED)
AP1000 DRAFT SAFETY EVALUATION REPORT
OPEN ITEM MEETING DAY 2
JULY 11, 2003

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E. Sullivan	NRC
S. Sheng	NRC
G. Imbro	NRC
K. Accornero	Westinghouse
M. Corletti	Westinghouse
D. Bhowmick	Westinghouse
W. Banford	Westinghouse
J. Lyons	NRC
C. Reid	Bechtel
L. Quinones-Navarro	NRC
J. Wilson	NRC
G. Bagchi	NRC
D. Terao	NRC
J. Colaccino	NRC
B. Gold	Westinghouse
K. Manoly	NRC
R. Barrett	NRC
W. Bateman	NRC
M. Khanna	NRC
A. Keim	NRC
S. Sun	NRC
N. Trehan	NRC
H. Walker	NRC

AP1000 LBB EVALUATION

Simon Sheng, NRR/DE

**Materials and Chemical Engineering Branch
U.S. Nuclear Regulatory Commission**

July 11, 2003

Rockville, Maryland

Attachment 2

REGULATIONS

- GDC 4:

“...dynamic effects associated with postulated pipe ruptures in nuclear power units may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping.”

REGULATIONS (CONTINUED)

- PART 52 REQUIREMENTS ON STANDARD DESIGN CERTIFICATION:

Paragraph 52.47(a)(2)

“[t]he application must contain a level of design information sufficient to enable the Commission to judge the applicant’s proposed means of assuring that construction conforms to the design and to reach a final conclusion on all safety questions associated with the design before the certification is granted.”

STAFF POSITION SPECIFIC TO LBB

- SECY-93-087:

“This [LBB] approval should be limited to instances in which appropriate bounding limits are established using preliminary analysis results during the design certification phase and verified during the COL phase.”

- SECY-02-0059:

“This [Westinghouse’s proposed approach] is not consistent with currently-approved ALWR policy. Postponing the completion of analyses for LBB piping until the COL phase would leave open the question of whether there is sufficient margin in the piping to demonstrate that the probability of pipe rupture is extremely low; thus, the finality of design might not be assured during design certification.”

Piping Design Acceptance Criteria Comparison

	Piping/Support	HELB	LBB	Benchmark Problem
ABWR	DAC	DAC	N/A	NUREG/CR-6049
System 80+	DAC	DAC	DAC (bounding curves) NRC reviewed 4 LBB calcs	NUREG/CR-6128
AP600	essentially complete (except support details)	essentially complete (except PW restraint details)	DAC (bounding curves) NRC reviewed 5 LBB calcs LBB confirmatory analysis	NUREG/CR-6414
AP1000	DAC	essentially complete (except PW restraint details)	DAC (bounding curves) no LBB calcs	Same as AP600 (NUREG/CR-6414)

For LBB, the requirements and policy for ALWRs is as follows:

GDC 4: “...dynamic effects associated with postulated pipe ruptures in nuclear power units may be excluded from the design basis when *analyses* reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping.” (emphasis added)

SECY-93-087: “(LBB) approval should be limited to instances in which appropriate bounding limits are established using preliminary analysis results during the design certification phase and verified during the COL phase by performing the appropriate ITAAC ...”

WESTINGHOUSE'S PROPOSED APPROACH FOR THE AP1000 LBB APPLICATION

- AT THE DESIGN CERTIFICATION (DC) PHASE:

Approval of the LBB application based on methodology

AT THE COMBINED LICENSE (COL) PHASE:

Using AP1000 loading (LBB input) to calculate LBB stresses (LBB output) and confirm that the stresses are below the BAC

- THIS APPROACH IS NOT CONSISTENT WITH PART 52 OR PAST DC APPLICATIONS

WESTINGHOUSE'S PROPOSED APPROACH (CONTINUED)

- INFORMATION REQUESTED BY STAFF TO SUPPORT CONCLUSION THAT AP1000 LBB CANDIDATE SYSTEMS SATISFY PART 52:**

Preliminary analyses of several limiting piping systems

EVALUATION OF PWSCC

- GENERAL COMMENTS

Operating plants have experienced PWSCC in the primary system (Alloy 600/82/182 materials)

AP1000 proposes to use a more SCC-resistant material, Alloy 690/52/152, in contact with the reactor coolant

Use of Alloy 690/52/152 materials does not guarantee SCC will not occur during the life of an AP1000 plant

Information requested by staff to support conclusion that AP1000 LBB candidate systems satisfy GDC-4:

- 1. Adopt resolution on PWSCC for operating plants, i.e., inspections**
- 2. Sensitivity study**

EVALUATION OF PWSCC (CONTINUED)

- SENSITIVITY STUDY

Intent is to assure that margins remain available under potential SCC scenario

Draft SRP 3.6.3 margins do not need to be applied to sensitivity study results

- SUMMARY

Combination of inspections and understanding of sensitivity study margins will provide sufficient defense in depth to address uncertainty from PWSCC

CONCLUSIONS

Issues discussed above require further information from Westinghouse and evaluation by staff

**Summary of DSER Open Item (OI) Actions
From July 10-11, 2003, Public Meeting
(listed in numerical order)**

OI 3.6.3.4-1

Westinghouse stated that they would evaluate this issue to determine the details involved in a sensitivity study. Both the NRC and Westinghouse agreed to have a conference call on this issue.

OI 3.6.3.4-2

Westinghouse stated that they could perform a additional qualitative assessment of the AP1000 LBB piping systems, which would expand on their August 5, 2002, letter. The staff agreed to go back and consider the applicant's proposal. Both the NRC and Westinghouse agreed to have a conference call on this issue.

OI 5.3.3-1

The NRC staff will arrange a conference call to discuss the technical issue with Westinghouse.

OI 8.2.3.1-1

Westinghouse will revise response and clarify discussion in DCD Tier 2 Chapter 8.

OI 9.5.2-1

NRC considers this item resolved.

OI 9.5.2-2

See OI 14.3.2-7.

OI 9.5.2-3

NRC considers this item confirmatory.

OI 9.5.2-4

NRC considers noise level issue resolved. NRC has reviewed DCD and therefore considers item resolved.

OIs 13.3-1 and 13.3-2

Westinghouse will revise various sections of the DCD, to provide consistency regarding identification of the MCR isolation triggering events. Westinghouse will provide the results of TSC doses under all design basis accidents.

NRC will review the design basis accident doses for the TSC, and confirm that GDC 19 will be complied with under all eight DBAs.

OI 14.2-1

NRC staff reviewing response.

OI 14.2.7-1

NRC still evaluating response.

OI 14.2.7-2

NRC still evaluating response.

OI 14.2.7-3

NRC considers this item confirmatory and will review revision to the Westinghouse Topical Report (WCAP).

OI 14.2.10-1

Westinghouse to revise response to clarify basis including reference to WCAP.

OI 14.2.10-2

NRC still evaluating response.

OI 14.2.10-3

NRC still evaluating response.

OI 14.2 10-4

Westinghouse will revise response to provide better justification for not performing a main steam isolation valve closure test at 100 percent power.

OI 14.3.2-1

NRC considers this item open pending the resolution of OI 3.8.2.1-1.

OI 14.3.2-2

NRC considers this item confirmatory.

OI 14.3.2-3

NRC considers this item confirmatory.

OI 14.3.2-4

NRC considers this item confirmatory.

OI 14.3.2-5

Westinghouse has made changes to DCD Tier 2 Chapter 9 which the NRC staff will need to review. There appears to be inconsistency in the DCD because the maintenance hatch hoist not seismically qualified yet will remain operable after a seismic event. Westinghouse stated that they will revise their OI response and DCD Tier 2 Section 9.5.3.

OI 14.3.2-7

NRC to review response. Westinghouse will review DCD Tier 2 Section 9.5.2 vs ITAAC and clarify what is onsite and offsite (i.e., in-scope verses out of scope) and revise DCD and response.

OI 14.3.2-11

Westinghouse will revise response to proposed COL Action Item to provide the pressurised thermal shock analysis as procured.

OI 14.3.2-12

NRC questioned the meaning of the phrase "a report exists and concludes," which is used in the acceptance criteria for many ITAAC. Westinghouse agreed to provide an explanation of the various meanings in the introduction to Tier 1.

OI 14.3.2-13

NRC considers this item open pending the resolution of OI 3.7.2.3-1.

OI 14.3.2-14

NRC does not consider OI response to be responsive to the issue.

OI 14.3.2-15

Westinghouse to revise response to 1) clarify air bottles and pressure transmitters not on list, 2) clarify inconsistency between DCD Tier 2 Table 17.4-1 and Tier 2 Table 3.7-1, and 3) review ITAAC for consistency with OI response Item 6.

OI 14.3.3-1

NRC considers this item confirmatory.

OI 14.3.3-2

NRC considers this item confirmatory.

OI 14.3.3-3

NRC considers this item confirmatory.

OI 14.3.3-4

NRC considers this item confirmatory.

OI 14.3.3-5

Westinghouse to revise response to define how screening criteria applied to block and permissives.

OI 14.3.3-6

NRC considers this item confirmatory.

OI 14.3.3-7

NRC considers this item resolved.

OI 14.3.3-8

NRC considers this item confirmatory.

OI 14.3.3-9

NRC considers this item confirmatory.

OI 14.3.3-10

NRC considers this item confirmatory.

OI 14.3.3-11

NRC considers this item confirmatory.

OI 14.3.3-12

NRC considers this item confirmatory.

OI 14.3.3-13

NRC considers this item confirmatory.

OI 14.3.3-14

NRC considers this item confirmatory.

OI 14.3.3-15

NRC considers this item confirmatory.

OI 14.3.3-16

NRC considers this item confirmatory.

OI 14.3.3-17

Westinghouse will revise their OI response. NRC requested that Westinghouse consider revising the language in Tier 1 and Tier 2.

OI 14.3.3-18

NRC considers this item confirmatory.

OI 14.3.4-1

NRC needs to discuss with Westinghouse further following resolution of OI 2.3.4-1.

OI 17.3.2-3

Westinghouse will revise their response to clarify that all records are kept for 60 years with specific exceptions.

OI 17.3.2-4

NRC considers this item confirmatory.

OI 17.5-1

Westinghouse has yet to provide response. Discussed clarification of NRC concern.

OI 18.3.3.1-1

NRC considers this item confirmatory.

OI 18.11.3.4-1

NRC considers this item confirmatory.

OI 18.11.3.5-1

Westinghouse will revise response.

OI 18.11.3.5-2

NRC considers this item confirmatory.

OI 18.11.3.5-3

NRC considers this item confirmatory.

OI 18.11.3.5-4

NRC considers this item confirmatory.

OI 18.11.3.6-1

NRC considers this item confirmatory.

OI 19.2.6-1

NRC will review response.

OI 19.2.6-2

NRC will review response.

OI 19.2.6-3

NRC considers item confirmatory pending review of PRA Chapter 13.

OI 19A.2-1

Westinghouse discussed one example with NRC. Westinghouse will revise their response to include the example discussed.

OI 19A.2-2

Westinghouse discussed AP600 final safety evaluation report 19A.2.1.2.1 as the technical basis for EPRI Report TR-103959. Westinghouse will revise response to be more responsive and may include an example or point to OI 19A.2-1.

OI 19A.2-3

Westinghouse will revise response to be more responsive and may include an example.

OI 19A.2-4

NRC does not feel reference is applicable to containment structure. Westinghouse will revise response to expand on how is conservative and justify why appropriate.

OI 19A.2-5

NRC asked why Westinghouse was using soil structure interaction? Westinghouse will revise response and PRA Chapter 55 to remove soil site reference in PRA.

OI 19A.2-6

Westinghouse reworded PRA because not written correctly. Tension ring does not consider new analysis - uplift effect. Westinghouse will assess whether the new analysis will be effected. NRC will review OI response.

OI 19A.2-7

Westinghouse will revise response to state "the requirements are included..."

OI 19A.2-8

NRC will not comment until review calculations in audit. NRC will also review uplift model during audit.

OI 19A.2-9

Westinghouse will revise response.

OI 19A.3-1

Westinghouse will verify the boolean cutset remains the same because the seismic response has changed between AP600 and AP1000 at specific locations.

OI 19A.3-2

NRC believes that a walkdown needs to be included in DCD. Westinghouse will review DCD Tier 2 Chapter 19 to see if COL item includes a walkdown and revise DCD and response as necessary.

OI 19A.3-3

NRC stated that the initiating event is 5 simultaneous tube ruptures. Settled on 5 because 1 rupture may take out adjacent tubes. Westinghouse will revise response to amplify that HCLPF calculation for supports are limiting for AP1000.

OI 20.7-2

NRC considers this item confirmatory.

AP 1000

cc:

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