Docket File
52-003

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 10, 1996

Mr. Nicholas J. Liparulo, Manager
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Westinghouse Electric Corporation
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SUBJECT: STATUS OF DRAFT SAFETY EVALUATION REPORT (DSER) OPEN ITEMS IN STANDARD SAFETY ANALYSIS REPORT (SSAR) SECTION 3 FOR THE CIVIL ENGINEERING AND GEOSCIENCES BRANCH (ECGB) REVIEW OF THE AP600 REACTOR DESIGN

Dear Mr. Liparulo:

The Nuclear Regulatory Commission (NRC) ECGB, completed its review in the mechanical engineering area of the AP600 SSAR through Revision 5. As an aid to reinitiate this review, ECGB prepared a summary of the status of some of the DSER open and confirmatory items in the scope of review for Chapter 3, "Design of Structures, Components, Equipment, and Systems." The enclosed summary includes items in DSER Section 3.2.1, "Seismic Classification," 3.2.2, "Quality Group Classification," 3.6.2, "Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping," 3.9.2, "Dynamic Testing and Analysis of Systems, Components, and Equipment," 3.9.3, "ASME Code Class 1, 2, and 3 Components, Supports, and Core Support Structures," 3.9.5, "Reactor Vessel Internals," 3.9.7, "Integrated Head Package," 3.10, "Seismic and Dynamic Qualification of Mechanical and Electrical Equipment."

The summary contains the latest staff positions relative to open and confirmatory items that were in the DSER issued November 1994. Two new requests for additional information (RAIs) are included in the summary, RAI Nos. 210.213 and 214.

The status of many issues do not agree with the Westinghouse AP600 Open Item Tracking System (OITS) database. In addition, there are several areas where technical differences have been identified that were not in the DSER. Items in the sections listed above that are not in the summary are considered resolved based on SSAR revisions. Please update the OITS database to reflect these changes.

This summary is intended to assist in communications between the NRC and Westinghouse, to inform Westinghouse of various staff positions, and can serve as an agenda for conference calls and/or meetings with the staff. Please contact me at (301) 415-8548 if you have any questions or when you are ready to discuss any of these issues.

D103

Summaries of open items in DSER Section 3.6.3, "Leak-Before-Break Evaluation," 3.9.6, "Testing of Pumps and Valves," and 3.12, "Piping Design" which are also in the mechanical engineering scope of the review, will be submitted in separate transmittals.

These followon questions affect nine or fewer respondents, and therefore is not subjected to review by the Office of Management and Budget under P.L. 96-511.

Sincerely,

original signed by:

Diane T. Jackson, Project Manager
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Docket No. 52-003

Enclosure: As stated

cc w/enclosure:
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AP600

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STATUS OF AP600 DSER OPEN ITEMS THROUGH SSAR REVISIONS 4 & 5

MECHANICAL ENGINEERING SCOPE OF REVIEW
DSER SECTIONS 3.2, 3.6, 3.9 AND 3.10

(xxxx) = Westinghouse Open Item Tracking System Database (OITS) Number

1. 3.2.1-1 (562) — Appendix B for all Seismic Cat. II - RG 1.29, Position C.4

   Action W — In the Open Item Tracking System Database (OITS), Westinghouse proposes to resolve this issue by developing "an approach for non-Appendix B Quality Assurance (QA) for Seismic II, Regulatory Treatment of Non-Safety Systems (RTNSS), fire protection, radwaste,...components." The staff does not agree that Seismic II components should be in the same non-Appendix B QA group as RTNSS, fire protection, etc. As stated in the DSER for this open item, to satisfy Position C.4 in RG 1.29, the pertinent QA requirements of Appendix B should be applied to all Seismic II structures, systems, and components. This commitment should be added to SSAR Section 3.2.1.1.2 and Table 3.2-1.

2. 3.2.1-2 (563) — Appendix B for fuel storage racks - RG 1.29

   Action W — In the OITS, Westinghouse proposes to resolve this issue by adding a note to the fuel rack classifications that they are Seismic Cat. I. As stated in the DSER for this open item, Sheet 19 of SSAR Table 3.2-3 already contains this commitment. The same commitment is in SSAR Sections 9.1.1.3 and 9.1.2.3. The issue in this open item is that Table 3.2-3 should contain a note that the design of new and spent fuel storage racks meet the applicable QA requirements of Appendix B.

3. 3.2.2-1 (564) — Classification of ECCS - RAIs 210.1 and 210.29

   Action W — In the OITS, Westinghouse proposes to resolve this issue by revising SSAR Section 3.2.2.5 to state that for AP600 Class C (ASME Class 3) lines that provide an ECCS function, the welds will be required to be spot radiographed. The staff has determined that this commitment will result in a piping system whose construction is enhanced to the extent that the quality of the applicable ASME Class 3 systems will be compatible with that of an ASME Class 2 system. Therefore, this open item will be resolved upon receipt of the revised SSAR.

Enclosure

4. 3.6.2-1 (592) Action W — Three inch break in subcompartments

In the DSER, the staff reported that Section 3.6.1 of the SSAR, Revision 0, indicated that structures inside containment containing high-energy piping are evaluated for pressurization loads due to a break area equivalent to a 7.6 cm (3-inch) nominal pipe size (NPS) primary system pipe. During the piping design review meetings, the staff informed Westinghouse that even if leak-before-break (LBB) is approved in a particular subcompartment, the 7.6 cm (3-inch) break might not be the controlling design criteria. The staff's position is that a minimum subcompartment pressure must be determined for designing the subcompartment walls and floors. This pressure should bound the effects of a high energy intermediate pipe break, with consideration of LBB acceptance. This was DSER Open Item 3.6.2-1. In Revision 4 to the SSAR, Westinghouse responded to this open item by deleting the 3-inch break criterion from Section 3.6.1, and referencing SSAR Sections 3.8.3.4 and 3.8.4.3.1.4. Section 3.8.3.4 states that subcompartments inside containment containing high-energy piping are designed for a pressurization load of 5 psi, and Section 3.8.4.3.1.4 states that the main steam isolation valve (MSIV) and steam generator blowdown compartments are designed for a pressurization load of 5 psi. During a review meeting on July 25 and 26, 1995, in response to a staff request for justification for the 5 psi pressurization load, Westinghouse agreed to another SSAR revision to define the 5 psi criterion as the minimum design pressure and include provisions for compartments that require a higher design pressure. In particular, the last paragraph of SSAR Section 3.6.1 and the definition of pressure load in Section 3.8.4.3.1.4 should be revised to specify that (1) the MSIV compartments are designed for pressurization loads due to the worst case of the 5 psi load and the worst case 1.0 sq. ft. main steam or feedwater line break, and (2) the steam generator valve compartments are designed for pressurization loads due to the worst case of the 5 psi load and the worst case double ended pipe rupture in the four-inch diameter steam generator blow down piping. In addition, this SSAR revision will add a COL requirement to verify the adequacy of subcompartment design pressure. The staff has not yet received this revision. Therefore, DSER Open Item 3.6.2-1 is still unresolved.

5. Q 210.40 New Item Action W — Break exclusion in steam generator (SG) and start-up FW lines

The SG blowdown lines were not addressed in the response to Q210.40. In addition, Revision 4 to SSAR Section 3.6.2.1.1.4 added the outboard high-energy portion of the start-up FW piping (located between the containment penetration and the first closed valve in the auxiliary building) to the list of

break exclusion zones. During the meeting with Westinghouse on July 25 and 26, 1995, the staff requested a more detailed basis for the break exclusion zones in these two piping systems. In response to this request, Westinghouse stated that, in addition to the break exclusion criteria in SSAR Section 3.6.2.1.1.4, which is consistent with standard review plan (SRP) 3.6.2, the 4 inch diameter SG blowdown and start-up FW lines will be subjected to an augmented inservice inspection (ISI) program in the break exclusion zones, which is beyond the ISI requirements of the ASME Section XI Code. The staff requested that this commitment be included in the SSAR. Since this issue originated after the issuance of the DSER, it is not identified by a DSER Open Item Number. However, the issue remains unresolved until the staff receives an acceptable revision to the SSAR.

6. 3.6.2.3-1 (595) Action W

Sketches of break locations and stress summary

These sketches and data summaries are currently not available. Westinghouse plans to complete the AP600 pipe break analyses some time in the future as part of design certification, subsequent to which the sketches and data summaries will be available. In the DSER, Westinghouse was requested to inform the staff when these analyses will be available for staff review. This was DSER Open Item 3.6.2.3-1. In the March 1995, draft revision of the SSAR, Westinghouse responded to this open item by proposing to revise Section 3.6.2.5, "Evaluation of Dynamic Effects of Pipe Ruptures on As-Built Piping Systems" to provide a description of the pipe break hazards analysis activities which will be completed by the COL applicant. The description of the hazards analysis included the information requested in this open item. This Draft Revision also added a new SSAR Section 3.6.4, "Combined License Information," which contained a commitment in a new subsection 3.6.4.1 that the COL applicant will complete a pipe rupture hazards analysis which will include the activities describes in the proposed revision to Section 3.6.2.5. However, the revisions to SSAR Sections 3.6.2.5 and 3.6.4.1 in Revision 4 to the SSAR are not the same as those proposed in the March 1995, draft. The description of the activities in the hazards analysis proposed in Section 3.6.2.5 and the reference to Section 3.6.2.5 in Section 3.6.4.1 were deleted. During the design review meeting on July 25 and 26, 1995, Westinghouse was requested to reincorporate these deletions in the SSAR. In addition, SSAR Section 3.6.2.5 should be further revised in accordance with the request which is discussed as a part of Open Item 3.6.2.3-5.

As discussed in Section 3.6.2.3 of the DSER, part of this open item included a staff review of AP600 Document No. GW-

N1-001, "Pipe Rupture Design Criteria," Revision B dated April 26, 1991, which was transmitted to the staff in a letter dated April 14, 1994. The staff's preliminary review has determined that, because this document was issued in 1991, there are several inconsistencies between this document and the SSAR. It is the staff's understanding that the piping designers will use the criteria in GW-N1-001 for the postulation of pipe breaks. Therefore, the staff will require a commitment in the SSAR that the criteria in GW-N1-001 and applicable portions of SSAR Sections 3.6.1, 3.6.2 and 3.6.3 are identical.

7. 3.6.2.3-2 (596) Environmental qualification - RAI 210.77

Action W Revision 4 of the SSAR does not appear to address this item., and Revision 5 did not include SSAR Section 3.6.2.

8. 3.6.2.3-5 (599) Separating structures - RAI 210.76

Action W Section B.1.c.(4) Branch Technical Position (BTP) MEB 3-1 states that in other than containment penetration areas, if a structure separates a high-energy line from an essential component, the separating structure should be designed to withstand the consequences of the pipe break in the high-energy line which produces the greatest effect at the structure, irrespective of the fact that the pipe rupture criteria in BTP MEB 3-1 might not require such a break location to be postulated. In Q210.76, the staff observed that: (1) Section 3.6.2 of the SSAR, Revision 0, did not appear to address this BTP MEB 3-1 guideline, and (2) Revision 1 to WCAP-13054 takes exception to this criterion and states that separating structures are designed for postulated terminal end breaks and breaks at the high stress locations. This exception is not completely acceptable. The staff requested Westinghouse to revise Section 3.6.2 of the SSAR to add a commitment to this position and delete the exception to this guideline in WCAP-13054. In the July 27, 1994 response to Q210.76, Westinghouse provided, in part, criteria for structures in the MS&FW system, and SG blowdown break exclusion zones for subcompartment pressurization effects. This part of the response has been evaluated in Open Items 3.6.2-1 and 3.6.2.2-1. However, the part of the response relative to structures outside the containment penetration area was not acceptable. In the DSER, the staff stated that Westinghouse should modify the SSAR to incorporate this BTP MEB 3-1 criterion for structures separating high-energy lines from essential components outside the containment penetration area and delete the exception to this guideline in WCAP-13054. This was DSER Open Item 3.6.2.3-5. The staff has determined that an acceptable procedure for resolving this open item would be for Westinghouse to (1) revise SSAR Section 3.6.2.5 as

requested in Open Item 3.6.2.3-1, which is discussed above, and (2) further revise SSAR Section 3.6.2.5 to include in the description of the activities in the COL hazards analysis a commitment that will satisfy the BTP MEB 3-1 criterion. In addition, the exception to this guideline in WCAP-13054 should be deleted. Pending receipt of an acceptable SSAR and WCAP revisions, DSER Open Item 3.6.2.3-5 remains open.

9. 3.9.2.1-1 (780) Action W — Scope of preoperational piping tests

SSAR Section 3.9.2 of the SRP states that the systems to be monitored during these tests should include

- ASME Code, Class 1, 2, and 3 piping systems
- high-energy piping systems inside seismic Category I structures
- high-energy portions of systems whose failure could reduce the functioning of seismic Category I plant features to an unacceptable safety level
- seismic Category I portions of moderate-energy piping systems located outside the containment

Section 3.9.2.1 of the SSAR only states that these tests will be conducted on ASME Class 1, 2, and 3 and other high energy piping systems, and Sections 14.2.8.1.77, 14.2.8.1.78, 14.2.8.1.82, 14.2.8.2.18, and 14.2.8.2.20 of the SSAR do not identify the systems to be tested. The staff's position is that all six of the above sections of the SSAR should be revised to state that all of the piping systems listed above will be included in the AP600 preoperational piping vibration, thermal expansion, and dynamic test programs. This was DSER Open Item 3.9.2.1-1. Revision 4 to the SSAR revised Section 3.9.2.1 to add a commitment to include all of the piping systems listed above in the AP600 pre-operational vibration and dynamics effects testing programs. However, SSAR Sections 14.2.8.1.77, 14.2.8.1.78, 14.2.8.1.82, 14.2.8.2.18, and 14.2.8.2.20 have not yet been revised to include this same commitment. Therefore, DSER Open Item 3.9.2.1-1 remains open.

10. 3.9.2.3-1 (782) Action W — Prototype plant (RG 1.20)

This open item will be evaluated as a part of Open Item 3.9.2.3-2.

11. 3.9.2.3-2 (783) — Flow-induced vibration prediction analysis

Action W The staff has received and reviewed Revision 1 (May 1, 1995) of the draft report of "AP600 Reactor Internals Flow-Induced Vibration Assessment Program" during and after the May 10, 1995 meeting. The staff's evaluation of the revised draft report concludes that Westinghouse should finalize the report by incorporating the following: (1) add a summary table of vibration prediction analysis results as included in Westinghouse letter dated June 1, 1995, (2) revise "Introduction" section and other parts of the report for consistency with the SSAR revision, such as including statements designating the reactor internals of the first AP600 plant as a prototype, and (3) to show additional sensors at the guide tubes in Table 8.1 for monitoring their vibrations, which will be consistent with the revised Table 3.9-4 of the SSAR. The final report should be submitted to the NRC and should be included in the list of references in a future revision of the SSAR Section 3.9.9 as discussed under DSER Open Item 3.9.2.3-1 above. Westinghouse has agreed to implement the above staff requests. Therefore, DSER Open Item 3.9.2.3-2 is technically resolved, pending acceptable completion of Westinghouse actions relative to the above requests.

12. 3.9.2.4-1 (785) Japanese CRDM seismic input tests - RAI 210.94

Action W The staff requested more detailed information regarding production tests of the control rod drive mechanism (CRDM) and acceptance standards for ensuring operational adequacy under loss of coolant accident (LOCA) and safe shutdown earthquake (SSE) events. In the June 27, 1994 response to Q210.94, and during a subsequent meeting, Westinghouse indicated that laboratory seismic testing with a combination of a fuel assembly, CRDM, and rod cluster control assembly has been performed in Japan to demonstrate the ability of rod insertion under Japanese standard earthquake levels. A copy of the reference regarding the testing was provided to the staff (Reference 14 in the response to Q210.94 and Reference 17 in SSAR Section 3.9.9, Revision 4). The staff's review of this reference determined that Westinghouse should verify whether the Japanese test input meets the seismic qualification level of the AP600 design. This was DSER Open Item 3.9.2.4-1. In addition, the staff was told that other tests of CRDMs to ensure functioning under LOCA loads were performed and documented in WCAP-8446. This report has been reviewed and accepted by the staff as a Topical Report, and since 1976, has been referenced in most pressurized water reactor (PWR) license applications whose CRDMs were designed by Westinghouse. In the response to Q210.94, Westinghouse also proposed a revision of Section 3.9.4.4 of the SSAR to provide more descriptive information about the CRDM tests.

This issue was resolved pending receipt of the SSAR revision. This was DSER Confirmatory Item 3.9.2.4-4.

However, during the May 1995 meeting, Westinghouse could not establish the basis for using the foreign test results for seismic qualification of the AP600 CRDM. Thus the referenced foreign test (Reference 17 in SSAR Section 3.9.9) was not suitable to be used for the CRDM seismic qualification of the AP600 plant. Westinghouse indicated that it will delete the reference to the test in SSAR Section 3.9.4.4 in a future revision of the SSAR. Westinghouse also indicated that demonstration of CRDM operability during a seismic event is impractical and insertion of control rods is not required as long as operability of CRDM is ensured immediately following the earthquake. The staff's subsequent evaluation concurs that demonstration of CRDM operability during a seismic event is not a regulatory requirement as long as its operability can be verified after the seismic event. However, Westinghouse should demonstrate adequacy of seismic qualification to ensure post-SSE operability of the control rod drive system in the AP600 design. In conclusion, further SSAR revision is needed to provide additional information to clarify the method and verify the adequacy of seismic qualification of the CRDM in the AP600 design. Thus Open Item 3.9.2.4-1 in conjunction with the Confirmatory Item 3.9.2.4-4 remains open, pending further Westinghouse actions.

13. 3.9.3.1-4 (789) COL commitment to design specifications

Resolved — Westinghouse was requested to revise SSAR Section 3.9.8.2 to add a commitment that Design Specifications and Design Reports completed by the COL will be made available for NRC audit. SSAR Revision 5 provided this acceptable commitment in Section 3.9.8.2. Resolution of this open item also resolves COL Action Item 3.9.3.1-1.

14. 3.9.3.1-5 (790) Intersystem LOCA (ISLOCA) criteria - RAI 210.61

Action W — In the response to RAI 210.61, the proposed revision to the SSAR Sections 1.9.5.1 and 5.4.7.2.2 did not include a commitment to design the low pressure side of the applicable piping systems to 40 percent of the reactor coolant system (RCS) design pressure. In a telephone conference on April 11, 1995, Westinghouse agreed to revise the SSAR to include this commitment. SSAR Revision 5 provided this acceptable commitment in Section 5.4.7.2.2. However, SSAR Section 1.9.5.1 has not yet been revised.

15. 3.9.3.1-6 (791) HVAC ductwork design criteria - RAI 210.5

Action W The staff has completed its review of Appendix 3G and 3H to Revision 3 of the SSAR which, respectively, describe the codes and standards, loads, load combinations, analysis and design methodology for the cable trays and cable supports, and heating, ventilation and air conditioning (HVAC) ducts and duct supports. The staff has identified the following items that need to be clarified by Westinghouse so that the staff may finalize its safety evaluation of analysis and design methodology for AP600 cable trays, HVAC ducts and their supports.

Appendices 3G and 3H state that the live load consists of 250 pounds to be applied only during construction on the raceway systems (cable trays and HVAC ducts) at a critical location to maximize flexural and shear stresses. This load is not combined with seismic loads. Westinghouse should state in both of these SSAR appendices that all removable items that have been used during construction or maintenance will not be attached to these systems during operation and that all loads will be considered as dead loads under operating conditions.

Appendices 3G and 3H specify an allowable stress of 1.6 times the basic allowable for the load combination that includes dead and seismic loads. Westinghouse needs to provide the basis for using the stress limit coefficient of 1.6 for the service load combination including SSE. In particular, Westinghouse needs to justify this factor for compressive stresses. Appendix 3H needs to be clarified to provide equations and methodology for calculating duct stresses due to pressure loads.

Seismic load effects on ducts include global and local effects. Appendix 3H should be clarified to describe the global effects to be determined by beam type analyses and local effects which may be assessed by analyses of panels bounded by stiffeners and subjected to pressures due to inertial loads. Appendix 3H states that ductwork within partially or fully vented buildings are subject to wind effects. However, ductwork exposed to wind/tornado loads should also be designed for missiles due to tornados in addition to pressure due to these effects. Finally, Westinghouse needs to describe the procedure for the analysis, design and qualification of cable tray and duct support anchors in concrete.

The staff's evaluation of this issue will be included in Section 3.8.4.4 of the final safety evaluation report (FSER).

16. 3.9.3.3-1 (792) Snubber criteria - RAI 210.69

Action W — In SSAR Section 3.9.3.4.3, Revision 4, the criterion for production operability tests of large bore snubbers, which states that these tests will include "a full service Level D load test to verify load capacity," needs to be clarified. It is not clear to the staff that such a test includes dynamic qualification testing. Section 3.9.3.4.3 should be revised to provide a more specific commitment that large bore snubbers will be subjected to dynamic qualification tests. A similar commitment should be provided in SSAR Section 1.9.4.2 under Generic Issue 113 as a part of the response to DSER Open Item 20.3-15.

17. 3.9.3.3-2 (793)
Action W — Anchor bolts (App. B of ACI 349) - RAI 210.107 and 220.84

Draft Revision 3 of the SSAR, Section 3.9.3.4 is identical to the response to RAI 210.107, and is not completely acceptable as stated in DSER Section 3.9.3.3. This issue is related to DSER Open Item 3.8.4.2-2.

18. 3.9.5-1 (794)
Resolved — Reactor internals design specifications

During the design review meeting on July 27 and 28, 1994, the staff found that detailed drawings, design and analysis specifications and scoping analysis of reactor internals are available, and design assumptions used are generally in conformance with regulatory positions. The staff was told that more detailed analyses to finalize the design were under preparation and near completion. Subsequent to completion of these final analyses, Westinghouse was requested to inform the staff when these documents are available for staff review. This was designated as DSER Open Item 3.9.5-1.

During the design review meeting on May 10, 1995, the staff found that Westinghouse had completed detailed structural and thermal analyses for those reactor internals components either not similar to a component found in earlier Westinghouse plants or similar, but traditionally having a low stress margin. These components include lower core support assembly, vortex ring assembly, lower radial key assembly, lower radial key restraint Clevis insert, upper support assembly, reflector assembly, and core barrel assembly. AP600 specific transient loads and load combinations were used. Analyses of these components are documented in Westinghouse Calculation No. MI01-S3A-001. Westinghouse also performed scoping analyses for other AP600 reactor internal components which have a high stress margin in similar existing designs. The scoping analyses are documented in Westinghouse Calculation No. MI01-M2C-001, which are preliminary analyses using best-estimate bounding loads. Westinghouse indicated that all analyses will be updated once the AP600 specific seismic and LOCA loads have been determined. Future

updated analyses are unlikely to change the reactor internals design significantly due to conservatively defined loads used in current analyses. Therefore, the staff concluded that Westinghouse had demonstrated that acceptable documentation exists to demonstrate the structural integrity of the AP600 reactor internals design. Thus Open Item 3.9.5-1 is closed.

19. 3.9.5-2 (795) Resolved — Revise SSAR Fig. 3.9-5 and 3.9-6

In SSAR, Revision 5, Figures 3.9-5 and 3.9-6 were revised to include key dimensions of reactor internals and other information requested in RAIs 210.17 and 210.101. In addition, Figure 3.9-8 was added to show reactor internals interface arrangement. Based on this acceptable response, this open item is now Resolved.

20. New Item RAI 210.213 Action W — 20 percent damping value for fuel assemblies

The staff found that in Table 3.7-1 of the SSAR, the damping value assigned for the fuel assemblies is 20 percent of critical damping. Westinghouse was requested to provide a basis that justifies the use of this damping value. This issue was originally a part of Open Item 3.7.1-3, however, it has been reassigned as an open issue in Section 3.9.5.

During the design review meeting on May 10, 1995, Westinghouse presented a response to the open item in a separate proprietary and non-proprietary attachment to a letter to NRC, NTD-NRC-95-4460, dated May 10, 1995. Westinghouse's evaluation of fuel assembly damping values by analysis and testing was provided. The response states that as a result of combined effects of inter-fuel assembly rubbing and scraping, fuel rod and grid spacer relative motions and frictional forces, and fluid-structure interactions in a closely packed reactor core, damping value increases as amplitude of vibration increases. The fuel assemblies are structurally flexible with low fundamental frequency, and a large amplitude response to postulated seismic loads is expected. Westinghouse's evaluation concludes that a uniform 10 percent of critical damping value is used for all modes higher than the fundamental mode, and use 20 percent of critical damping value for the fundamental mode to account for additional hydrodynamic effects. However, a subsequent staff review of fuel assembly test results under in-core conditions found that, as shown in Figure 3 of the response, a best-fit curve in a widely scattered database was used to justify the 20 percent of critical damping value for the fundamental mode, which appears nonconservative. In order to ensure adequate margin to bound data uncertainty, a 10 percent of critical damping value also for the fundamental mode appears more appropriate. Westinghouse is requested to use a uniform

10 percent of critical damping value for all modes of vibration for the fuel assemblies in its seismic dynamic analysis and to revise the SSAR Table 3.7-1 accordingly.

21. New Item — Potential thinning of incore neutron monitoring thimble tubes.

RAI 210.214
Action W — The incore neutron monitoring thimble tubes have experienced thinning as a result of flow-induced vibration in operating PWRs of Westinghouse design. NRC Bulletin 88-09 had requested all licensees of these plants to establish and implement an inspection program to periodically confirm incore thimble tube integrity. Westinghouse is requested to provide information to verify that either such a concern does not exist in AP600 due to an improved thimble design, or an inspection program in conformance with guidelines stated in NRC Bulletin 88-09 was established and will be implemented as a COL action item in all AP600 plants. In the latter case, provide a description of the inspection program in the SSAR.

22. 3.9.7-1 (812) — Deflection limits for integrated head package - RAI 210.97

Action W — SSAR Section 3.9.7.3 states that because of the application of LBB, breaks are not postulated in reactor coolant loop (RCL) pipes down to 4-inch diameter. Therefore, these loads are not considered in the design of the integrated head package. It should be noted that the application of LBB in small lines has not yet been endorsed by the staff. Subsequent to the resolution of Open Items 3.6.3.4-1 and 3.6.3.6-4, loads from postulated breaks in some small diameter pipe may have to be included in this design.

In DSER Open Item 3.9.7-1, the staff requested a description of the analyses and or test data that was used to establish the deflection limit of the top of the control rod drive mechanism rod travel housing. The response to this open item in Revision 5 to Section 3.9.7.3 of the SSAR does not provide sufficient detail for the staff to prepare a safety evaluation of this issue. As a part of a future design review meeting with the staff, Westinghouse is requested to identify the documents that contain a description of these analyses and tests, and be prepared to discuss the design basis loads and methodology used to establish the deflection limits, and the test procedures and results obtained to demonstrate that the drive rod will not bind during insertion while being subjected to these loads. If these analyses and tests were not AP600 specific, discuss the basis for applying the results to the AP600 design.

Pending (1) resolution of Open Items 3.6.3.4-1 and 3.6.3.6-4, and (2) the staff's review and acceptance of the analysis and testing discussed above, Item 3.9.7-1 remains open.

23. 3.10-1 (813) Action W — Use of seismic experience data

Revision 5 to the SSAR revised Section 10.2 to respond to this issue. This revision is identical to the response to Q210.81. In Section 3.10 of the DSER, dated November, 1994, the staff stated that this response was not completely acceptable, and identified this issue as a DSER Open Item. The SSAR should be revised to state that the COL applicant will submit all of the information described in the DSER to the staff for review and approval prior to including this information in the equipment qualification file. In addition, WCAP-13054 should be revised to delete the exception to the applicable portion of SRP 3.10.

24. 3.10-2 (814) Action W — Dynamic analysis of valve disks

Revision 5 to the SSAR revised Section 3.[illegible]2.2 to respond to this item. The revision states, "Valve disks are evaluated for maximum design line pressure and maximum differential pressure resulting from plant operating, transient, and accident conditions." This does not appear to address the issue as described in the DSER, i.e., the SSAR should be revised to describe the methodology used in the AP600 design to analyze the feedwater line valve disks when they are subjected to dynamic loads due to a LOCA. In addition, as requested in the DSER, WCAP-13054 should be revised to delete an exception to SRP, Section 3.10.II.1.a(14)(b).

25. 3.10-3 (815) Action W — RCPB valve leakage per SRP 3.10 should be in SSAR

Revision 5 to the SSAR revised Section 3.10.2.2 to provide an acceptable response to this item. However, the exception to SRP, Section 3.10.II.4 in WCAP-13054 has not yet been deleted. Therefore, this issue remains open.

26. 3.10-4 (816) Action W — Aging by analysis - IEEE 323-1983 vs 1974

Revision 5 to the SSAR revised Appendix 3D to commit to the staff's position to use IEEE 323-1974 rather than the 1983 edition. However, SSAR, Section 3.11 has not yet been revised to provide the same commitment (Ref. Open Item 3.11.3.2-1), and WCAP-10354 has not yet been revised to delete the exception to SRP Section 3.10.II.1.c.

27. 3.10.5 (817) — Commitments to SRP 3.10

Resolved	Revision 5 to the SSAR revised Appendix D, Attachment E, Section E.5 to provide a partial response to this open item, which complements information relative to operability and seismic qualification of electrical and mechanical equipment in other SSAR sections. The staff has concluded that the current information in SSAR Sections 3.9.2.2, 3.9.3.2, 3D.4.1.2, 3D.6.2, E.3.2, E.4.3, and E.5 collectively provides acceptable commitments to the guidelines of SRP 3.10.

STATUS OF DSER CONFIRMATORY ITEMS THROUGH SSAR REVISIONS 4 and 5

CHAPTER 3 - MECHANICAL ENGINEERING SCOPE OF REVIEW

(XXXX) = Westinghouse Open Item Tracking System (OITS) Number

1.	3.2.1-1 (1773) Open	Classification of supports - RAI 210.34 SSAR Section 3.2.4 through Revision 5 has not yet been revised.
2.	3.2.2-1 (1774) Resolved	Classification of Normal Residual Heat Removal (RHR) System - RAI 210.37 SSAR Revision 5 revised Section 5.4.7.1.1 to include the acceptable response to RAI 210.37.
3.	3.2.2-2 (1775) Resolved	Classification of Passive RHR heat exchanger (HX) supports - RAI 210.38 SSAR Revision 5 revised Section 5.4.14.1 to include the acceptable response to RAI 210.38.
4.	3.2.2-4 (1777) Open	Add core barrel to Table 3.2-3 - RAI 210.71 SSAR Table 3.2-3 through Rev.5 has not yet been revised.
5.	3.9.2.1-1 (1789) Open	Preop. piping tests on first plant only - RAI 210.53 SSAR Revision 4 revised Section 3.9.2.1, however, Sections 14.2.8.1.78 and .82, and 14.2.8.2.20 have not yet been revised (through Revision 5).
6.	3.9.2.1-3 (1791) Open	Use OM-7 rules for preop. thermal tests - RAI 210.55 SSAR Revision 4 revised Section 3.9.2.1.2, however, Sections 14.2.8.1.67 and 14.2.8.2.18 have not yet been revised (through Revision 5). In addition, the staff has determined that Section 14.2.8.1.49 should also be revised to provide the same commitment.
7.	3.9.2.1-4 (1792) Open	Reference SSAR 3.9.2.1.1 in 14.2.8.1.78 - RAI 210.57 Section 14.2.8.1.78 has not yet been revised (through Revision 5).
8.	3.9.2.3-1 (1793)	Flow-induced vib. tests for all plants - RAI 210.58

Open — SSAR Revision 4 revised Section 3.9.2.4, however, Section 14.2.8.1.77 has not yet been revised (through Revision 5)

9. 3.9.2.4-3 (1796) — Design rules for reactor internals - RAI 210.70
Open — SSAR Revision 4 revised Section 3.9.5.2.4, however, Table 3.2-3 has not yet been revised (through Revision 5) to provide the same commitment.

10. 3.9.2.4-4 (1797) — Description of control rod drive (CRD) tests - RAI 210.94
Open — This item will be resolved in conjunction with the resolution of Open Item 3.9.2.4-1.

11. 3.9.3.3-2 (1801) — Allowable stresses for active component supports-RAI 210.68
Open — SSAR Revision 3 revised Section 3.9.3.4 to agree with the staff's request. However, the response to RAI 210.68 also agreed to revise WCAP-13054 to delete an exception to SRP 3.9.3, Section II.3.a. This WCAP has not yet been revised.

12. 3.9.3.3-3 (1802) — Load rating method for linear supports - RAI 210.74
Open — SSAR Revision 3 revised Appendix 1A to agree with the staff's request. However, the response to RAI 210.74 also agreed to revise WCAP-13054. This WCAP has not yet been revised.

13. 3.9.3.3-4 (1803) — Load rating method for plate and shell supports - RAI 210.75
Open — SSAR Revision 3 revised Appendix 1A to agree with the staff's request. However, the response to RAI 210.75 also agreed to revise WCAP-13054. This WCAP has not yet been revised.

14. 3.9.5-1 (1804) — Dimensions of reactor internals - RAI 210.99

15. 3.9.7-1 (1807) — Classification of integrated head package - RAI 210.72
Open — SSAR Revision 4 provided acceptable revisions to Sections 3.9.7.1, 3.9.7.3, and 3.9.8. However, Table 3.2-3 has not yet been revised.

16. 3.10-1 (1808) — Revisions of Appendix 3D - RAI 210.7
Resolved — SSAR Revision 5 revised Sections 3D.4.1.2, E.4.4, E.5.1, and E.5.2.4 in Appendix 3D to provide the acceptable responses to RAI 210.7.

17. 3.10-2 — Delete exception to SRP 3.10 in WCAP-13054 - RAI 210.82

(1809)
Open — WCAP-13054 has not yet been revised.

18. 3.10-3 — Delete exception to SRP 3.10 in WCAP-13054 - RAI 210.83
(1810)
Open — WCAP-13054 has not yet been revised.

19. 3.10-4 — Delete exception to SRP 3.10 in SSAR and WCAP - RAI 210.86 and 210.88
(1811)
Open — SSAR Revision 5 revised Section 3.10.4 to provide part of the acceptable responses to RAIs 210.86 and 210.88. However, the remainder of the response to these RAIs, i.e., to add Item 3.13 to SSAR Table 1.8-1 has not yet been provided through Revision 5. In addition, WCAP-10354 has not been revised to eliminate an exception to SRP 3.10, Section 3.

20. 3.12.3.6-1 — Equivalent static load method - RAI 210.48
(1812)
Action W — This issue is not yet resolved. Westinghouse should revise SSAR, Section 3.7.3.5 to commit to use a 1.5 amplification factor unless adequate justification for a lower factor is provided.

21. 3.12.5.5-1 — Combination of closely spaced modes
(1814)
Action W — This issue will be resolved as a part of Open Item 3.12.4.1.1.

22. 3.12.5.13-1 — SAM + inertia loads - RAIs 210.32 and 210.79
(1815)
Open — WCAP-13054 has not yet been revised.