AP1000DCDFileNPEm Resource

From: Loza, Paul G. [lozapg@westinghouse.com]
Sent: Tuesday, December 30, 2008 1:19 PM
To: Bill Gleaves
Cc: Perry Buckberg; Rhonda Carmon; Lindgren, Donald A.
Subject: FW: Acknowledgement of AP1000 3.7.1 final version RAIs
Attachments: AP1000 3.7 final RAIs Rev WCG.doc

Billy,

I acknowledge receipt for Westinghouse of the attached RAI-SRP3.7.1-SEB1-15, -16, and -17. These replace the original draft RAIs of the same names that were sent by email from Billy Gleaves to Sam Adams, dated 10/23/08. At this time we accept these as the Final Versions.

I will let you know as soon as possible if a clarification call is necessary.

Thanks,

Paul

From: Bill Gleaves [mailto:Bill.Gleaves@nrc.gov]
Sent: Wednesday, December 17, 2008 3:16 PM
To: Lindgren, Donald A.
Cc: Behnke, Donald H.; Loza, Paul G.; Bret Tegeler; Pravin Patel; Brian Thomas
Subject: AP1000 3.7.1 draft RAIs Rev WCG.doc

Hi all,

Attached are Revised Draft RAIs on SRP 3.7.1. They are: RAI-SRP3.7.1-SEB1-15, -16, and -17. These replace the original draft RAIs of the same names that were sent by email from Billy Gleaves to Sam Adams, dated 10/23/08.

Please let me know if you have received this draft RAI. Also let me know if you accept these draft RAIs, and if so, please send back to me by email as "final RAIs." If you cannot accept them as is, then please let me know when you can support a conference call.

Billy

Hearing Identifier: AP1000_DCD_Review
Email Number: 151

Mail Envelope Properties (E501235702183E47BF44683A3B6A1929013A4593D34A)

Subject: FW: Acknowledgement of AP1000 3.7.1 final version RAIs
Sent Date: 12/30/2008 1:18:39 PM
Received Date: 12/30/2008 1:18:57 PM
From: Loza, Paul G.

Created By: lozapg@westinghouse.com

Recipients:
"Perry Buckberg" <Perry.Buckberg@nrc.gov>
Tracking Status: None
"Rhonda Carmon" <Rhonda.Carmon@nrc.gov>
Tracking Status: None
"Lindgren, Donald A." <lindg1da@westinghouse.com>
Tracking Status: None
"Bill Gleaves" <Bill.Gleaves@nrc.gov>
Tracking Status: None

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Files	**Size**	**Date & Time**
MESSAGE	1210	12/30/2008 1:18:57 PM
AP1000 3.7 final RAIs Rev WCG.doc	38464	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

AP1000 DCD, Revision 16, Section 3.7.1

Draft Request for Additional Information (RAI)
17 December 2008
(previously sent as draft on October 22, 2008)

RAI-SRP-3.7.1-SEB1-15

(a) DCD Revision 16, Section 3.7.2.8.1, identifies that the portion of the Annex Building adjacent to the nuclear island is classified as SC-II, and describes the Annex Building seismic analysis models used for soil sites and for the hard rock site. There is no discussion of design allowables and acceptance criteria. The staff requests Westinghouse to confirm that SC-II structures are evaluated in accordance with the staff-accepted approach, as described in DCD Revision 16, Section 3.7.2.

DCD Revision 16, Section 3.7.2, states: "Seismic Category II building structures are designed for the safe shutdown earthquake using the same methods and design allowables as are used for Seismic Category I structures. The acceptance criteria are based on ACI 349 for concrete structures and on AISC N690 for steel structures including the supplemental requirements described in subsections 3.8.4.4.1 and 3.8.4.5."

(b) The staff requests Westinghouse to clarify the seismic classification of the remainder of the Annex Building, and also confirm that, for analysis purposes, the entire annex building has been treated as seismic Category II. If this is not the case, provide the technical basis for not treating it as such.

DCD Revision 15, Section 3.7.2.8.1, states "The annex building is classified as seismic Category II." DCD Revision 16, Section 3.7.2.8.1, states "The portion of the annex building adjacent to the nuclear island is classified as seismic Category II." It is silent about the seismic classification of the remainder of the Annex Building.

(c) Provide the technical basis for NOT classifying the turbine building as SC-II, considering its proximity to the nuclear island and the infeasibility of demonstrating the acceptability of a collapse.

DCD Revision 15, Section 3.7.2.8.3, states "…the major structure of the turbine building is separated from the nuclear island by approximately 18 feet." DCD Revision 16, Section 3.7.2.8.3, deleted this statement and additional descriptive information about the turbine building. Based on the information in DCD Revision 16, Section 3.7.2.8.3, the staff cannot determine whether the "non-seismic" classification is still valid.

RAI-SRP-3.7.1-SEB1-16

(a) Identify the values of structural material damping that were used in the HRHF-based seismic analyses, and demonstrate consistency with the guidance in RG 1.61, Rev. 1, on the use of response-compatible damping values.

DCD Rev 15, Section 3.7.2, describes the design-basis seismic analyses performed for the SSE (i.e., modified RG 1.60 spectra at 0.3 g PGA) applied to a hard rock site.

DCD Rev. 16 added Appendix 3G to describe the revised seismic design-basis, for the SSE applied to a range of layered soil sites, in addition to the original hard rock site. The description in Rev. 15, Section 3.7.2 was deleted. DCD Rev 16 also added Appendix 3I to describe the seismic analysis results for CEUS hard rock high frequency (HRHF) site spectra. The results for the HRHF site spectra, presented in Appendix 3I, indicate a lower seismic response of the structures than for the SSE. RG 1.61, Rev. 1, presents guidance on the use of response-compatible structural damping values. As the response level of a structure decreases, the effective damping also decreases.

(b) The staff requests Westinghouse: (1) specifically define the types of cable tray supports/configurations for which DCD Figure 3.7.1-13 is judged to be applicable; (2) identify whether any of these types of supports/configurations are candidates for use in AP1000; and (3) if not candidates, delete DCD Figure 3.7.1-13.

The staff notes that the damping values shown in DCD Figure 3.7.1-13 were developed from tests conducted in the 1980s during the Systematic Evaluation Program (SEP), to seismically qualify as-built cable tray systems that had not been seismically analyzed at the plant design stage. It is unclear to the staff whether the support types/configurations that produced 20% damping values will be implemented for new design applications.

DCD Revisions 15 and 16, Section 3.7.1.3, both state: "The damping values for conduits, cable trays and their related supports are shown in Table 3.7.1-1 and Figure 3.7.1-13. The damping value of conduit, empty cable trays, and their related supports is similar to that of a bolted structure, namely 7 percent of critical. The damping value of filled cable trays and supports increases with increased cable fill and level of seismic excitation. For cable trays and supports demonstrated to be similar to those tested, damping values of Figure 3.7.1-13 may be used. These are based on test results (Reference 19)." In RG 1.61, Rev. 1, (March 2007), the staff currently accepts a maximum of 10% damping for cable tray systems, independent of the support type/configuration.

(c) The staff requests Westinghouse: (1) identify whether it plans to implement the RG 1.61, Rev. 1, damping values for electrical cabinets and cable trays; and (2) if damping values different from RG 1.61, Rev. 1, are used, provide the technical basis for concluding that the selected damping values will provide sufficient conservatism, including reference to recognized, readily available, and well documented test results that support the use of the selected damping values, and also addresses the uncertainty associated with scatter of the measured data.

DCD Revisions 15 and 16, Section 3.7.1.3, Table 3.7.1-1, lists damping values for use in seismic analysis of seismic Category I structures, systems, and components. The staff notes that the listed damping values for electrical cabinets and cable trays are not consistent with the damping values currently acceptable to the staff, as identified in RG 1.61, Rev. 1, (March 2007).

(d) The staff requests Westinghouse: (1) identify whether it is implementing the RG 1.61, Revision 1 damping values for design-basis piping analyses; (2) identify the piping damping values used in the HRHF sample piping analyses; and (3) if damping values different from RG 1.61, Rev. 1, are used, provide the technical basis for concluding that the selected damping values will provide sufficient conservatism, including reference to recognized, readily available, and well documented test results that support the use of

the selected damping values, and also addresses the uncertainty associated with scatter of the measured data.

Westinghouse states in DCD Section 3.7.3.15, Revision 15 and Revision 16: "Piping systems analyzed by the uniform envelope response spectra method with rigid valves can be evaluated with 5 percent damping. Five percent damping is not used in piping systems that are susceptible to stress corrosion cracking." The staff previously accepted this in the FSER for DCD Revision 15. The complete list of restrictions that the staff placed on the use of 5% piping damping is in FSER Section 3.12. Although not specifically identified in DCD Section 3.7.3.15, the staff placed a restriction on the ground response spectra; the PGA frequency of the ground spectra cannot exceed 33 Hz. Therefore, 5% piping damping is not applicable to piping analyses for CEUS HRHF sites.

RG 1.61, Revision 1 (March 2007) identifies either 4% damping without restrictions or former Code Case N-411 damping with restrictions, as being acceptable to the staff, based on a re-assessment of available piping damping data. Therefore, use of 5% damping for the uniform envelope response spectra method with rigid valves is not consistent with the latest staff guidance.

RAI-SRP-3.7.1-SEB1-17

(a) The staff requests that Westinghouse specifically describe its compliance with or deviations from SRP 3.7.2, Rev. 3, and RG 1.92, Rev.2; and provide the technical basis for the adequacy of all seismic analysis methods and acceptance criteria that deviate from the current staff guidance.

In DCD Revision 15, Section 3.7.2.1, Westinghouse stated "Seismic analyses of the nuclear island are performed in conformance with the criteria within SRP 3.7.2." The staff confirmed in its detailed review of DCD Revision 15, Section 3.7.2, that Westinghouse had committed to the provisions of SRP 3.7.2, Rev. 2, (and supporting RGs), in existence at the time of the staff's review. Subsequent to the issuance of the staff's FSER on DCD Revision 15 in September 2004, the staff issued SRP Section 3.7.2, Rev. 3, in March 2007 and supporting RG 1.92, Rev. 2, in July 2006. The staff notes that DCD Revision 16 still states "Seismic analyses of the nuclear island are performed in conformance with the criteria within SRP 3.7.2." However, the staff's detailed review of Revision 16, Section 3.7.2, determined that Westinghouse has not committed to the latest staff guidance. The methods and acceptance criteria cited are the same as in Revision 15.

(b) The staff requests Westinghouse to (1) identify whether it is implementing the RG 1.92, Rev. 2 and SRP 3.7.2, Rev. 3, guidelines for conducting response spectrum analysis; and (2) if not, provide the technical basis for concluding that the response spectrum analysis methods Westinghouse has applied provide comparable accuracy.

RG 1.92, Rev. 2, (July 2006) and SRP 3.7.2, Rev. 3, (March 2007) updated the staff guidelines to improve the accuracy of results obtained when implementing the response spectrum analysis method for SC-I systems and subsystems. DCD Revision 16, Section 3.7.3.7, "Combination of Modal Responses", describes Westinghouse's procedures for response spectrum analysis. These are unchanged from DCD Revision 15, which pre-dates the latest staff guidance.

(c) The staff requests Westinghouse (1) identify whether it satisfies the latest SRP Section 3.7.2.II.1.a.iv acceptance criteria for confirming adequate model refinement; and (2) if not, to provide the technical basis for concluding that the method Westinghouse applied provides sufficient solution accuracy.

In March 2007, the staff issued Revision 3 to SRP 3.7.2. The acceptance criteria formerly provided in SRP Section 3.7.2.II.3, to confirm the adequacy of the model refinement, has been deleted. It has been replaced by a new criterion based on review of modal responses up to the maximum frequency of interest. This is described in SRP Section 3.7.2.II.1.a.iv.

(d) The staff requests Westinghouse to identify whether it is implementing the RG 1.92, Revision 2 approach, and if not, to provide the technical basis for concluding that the method Westinghouse is applying provides a comparable level of solution accuracy.

An acceptable method to account for the modes corresponding to frequencies higher than the PGA frequency in a mode superposition time history analysis is described in RG 1.92, Revision 2, Regulatory Position C.1.4.1 (July 2006), and is referenced in SRP 3.7.2 (March 2007).