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Subject: AP1000 Response to Proposed Open Item (Chapter 3)

Westinghouse is submitting the following responses to the NRC open item (OI) on Chapter 3. These proposed open item responses are submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in these responses is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following proposed Open Item(s):

OI-SRP3.2.1-EMB2-03
OI-SRP3.2.1-EMB2-06
OI-SRP3.2.2-EMB2-01

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

A handwritten signature in black ink, appearing to read 'R. Sisk' with a stylized flourish at the end.

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Enclosure

1. Response to Proposed Open Item (Chapter 3)

cc:	D. Jaffe	- U.S. NRC	1E
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ENCLOSURE 1

AP1000 Response to Proposed Open Item (Chapter 3)

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Response to SER Open Item (RAI)

RAI Response Number: OI-SRP3.2.1-EMB2-03
Revision: 0

Question:

In Revision 16 of the DCD Subsection 3.2.1.1.2 was revised to reference DCD Section 17.5, "Combined License Information Items," rather than 17.4, "Design Reliability Assurance Program," for the combined license Quality Assurance (QA) requirements for seismic Category II SSCs. During the review of Revision 16, the staff determined that DCD Table 3.2-3 included in Revision 16 did not identify specific augmented QA requirements that apply to seismic Category II SSCs. The staff was concerned that DCD Section 3.2, DCD Table 3.2-3 or DCD Chapter 17 do not adequately define specific augmented QA requirements of Appendix B for seismic Category II SSCs. It was not clear if the COL applicant is to provide these requirements for the procurement of non-site-specific SSCs. In RAI-SRP3.2.1-EMB2-03 the applicant was requested to clarify to what extent the pertinent QA requirements of Appendix B to 10 CFR Part 50, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," apply to non-site-specific seismic Category II SSCs and to identify the DCD subsection or other document that describes those requirements.

The RAI response restated the DCD Subsection 3.2.1.1.2 statement that pertinent portions of 10 CFR 50 Appendix B apply to seismic Category II SSCs and that pertinent portions are those required to provide that unacceptable structural failure or interaction with seismic Category I items does not occur. The response further clarified that seismic Category II SSCs are covered by the same quality programs and procedures as seismic Category I and the extent of design activities are determined by the responsible engineers and are identified in the design specifications and design criteria documents.

The staff reviewed the changes included in Revision 17 to the DCD and determined that neither DCD Section 3.2, Table 3.2-3 nor Section 17.5 has been revised to identify specific augmented QA requirements for seismic Category II SSCs.

Westinghouse Response:

Westinghouse has reviewed the staff's comments concerning the identification of augmented QA requirements applicable to AP1000 seismic Category II SSCs. However, Westinghouse respectfully does not agree with the staff's position that specific QA requirements for seismic Category II SSCs should be included in the DCD.

As described in the AP1000 DCD, Section 3.2.1, seismic Category II is applied to "...plant structures, systems, and components which perform no safety-related function, and the continued function of which is not required. ... Structures, systems and components are classified as seismic Category II to preclude their structural failure during a safe shutdown earthquake or interaction with seismic Category I items which could degrade the functioning of a

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safety-related structure, system, or component to an unacceptable level, or could result in incapacitating injury to occupants of the main control room.”

Based upon the definition of seismic Category II and the AP1000 safety classification requirements in DCD Table 3.2-1; seismic Category II SSCs are non-safety related items that are subjected to seismic analysis to verify integrity in the event of a seismic event. Therefore, the application of seismic Category II is limited to the analysis and design of affected SSCs. For the AP1000, seismic Category II is applied in three different approaches:

- 1) SSCs which are defined as Seismic Category II in the design phase and are identified in design specifications
- 2) SSCs that are identified as a result of plant layout review, which require seismic analysis of supports and/or anchorages for incidents of unacceptable interaction
- 3) SSCs that are identified as a result of programmatic requirements, which require seismic analysis of supports and/or anchorages for post-72 hour support

For those SSCs that are designated as Seismic Category II in the design phase, SSC design requirements are conveyed to suppliers through the use of design specifications developed in accordance with approved Westinghouse policies and procedures. Additionally, procurement of these SSCs is also applicable to approved policies and procedures, in accordance with the Westinghouse AP1000 quality plan as described in DCD Section 17.3.

The remaining seismic Category II SSCs represent applications subject to seismic analysis to confirm SSC integrity is maintained by means of supports and/or anchorages. These SSCs do not specify seismic Category II criteria through design specifications and procurement. Instead, these SSCs are subjected to seismic analysis in accordance with Westinghouse policies and procedures.

Augmented quality assurance, in accordance with DCD Table 17-1, is applicable to those SSCs that are contained within the Investment Protection Short Term Availability Controls in DCD Section 16.3. These SSCs, and any applicable seismic requirements, have been identified as a function of the AP1000 Regulatory Treatment of Nonsafety Systems (RTNSS) evaluation. These SSCs will apply augmented quality assurance to these SSCs independent of their seismic classification, in accordance with the scope of the RTNSS process.

In conclusion, AP1000 seismic Category II SSCs are subject to the Westinghouse AP1000 quality plan as described in DCD Section 17.3. The analysis and design of AP1000 seismic Category II SSCs implement applicable portions of 10 CFR 50 Appendix B through the application of approved policies and procedures. Furthermore, Westinghouse has concluded that the Westinghouse AP1000 quality plan is the appropriate mechanism for identification of those portions of 10 CFR 50 Appendix B that are applicable to the analysis and design of AP1000 seismic Category II SSCs.

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For clarification of these comments, a suggested markup to the AP1000 DCD is attached to this response.

Design Control Document (DCD) Revision:

3.2.1.1.2 Seismic Category II (C-II)

Pertinent portions of 10 CFR 50, Appendix B apply to **the analysis and design of** seismic Category II structures, systems, and components. The quality assurance requirements for **the analysis and design of** seismic Category II structures, systems, and components **are performed in accordance with the Westinghouse AP1000 quality plan as described in Section 17.3 and** are sufficient to provide that these components will meet the requirement to not cause unacceptable structural failure of or interaction with seismic Category I items. See Section 17.5 for the Combined License applicant quality assurance program requirement.

PRA Revision:

None

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RAI Response Number: OI-SRP3.2.1-EMB2-06
Revision: 0

Question:

In RAI-SRP3.2.1-EMB2-06, the applicant was requested to provide a list of SSCs necessary for continued operation or an alternative to address the requirements. If DCD Table 3.2-3 serves this purpose, the applicant was requested to clearly state in the DCD that the Table contains the list of SSCs necessary for continued operation.

Westinghouse Response:

The response to RAI-SRP3.2.1-EMB2-06 transmitted with Westinghouse Letter DCP_NRC_002620, dated September 17, 2009 (ADAMS Accession Number ML092640644) is superseded by this response.

The structures, systems, and components (SSCs) necessary to protect the public health and safety are the safety related (AP1000 Equipment Class A, B, and C) SSCs identified in Section 3.2.2 of the AP1000 Design Control Document (DCD) and tabulated in DCD Table 3.2-3. These SSCs are those necessary to ensure: (1) the integrity of the reactor coolant pressure boundary; (2) the capability to shut down the reactor and maintain it in a safe shutdown condition; or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures. Consistent with the guidance of Regulatory Guides 1.70 and 1.206 for Subsection 3.2.2 the classification of SSCs in Table 3.2-3 addresses fluid systems and mechanical systems. In addition to the systems and components identified in Table 3.2-3 the Protection and Safety Monitoring System (PMS) and Class 1E dc and UPS system (IDS) are Equipment Class C, safety-related systems that provide instrumentation and electrical power. The seismic classification of the structures that are part of the AP1000 standard design is tabulated in DCD Table 3.2-2.

As noted in DCD Subsection 3.2.2.2 Equipment Class A, B, and C SSCs are seismic Category I. As noted in DCD Subsection 3.2.1.1.1, seismic Category I SSCs are designed, analyzed, and qualified to survive the safe shutdown earthquake (SSE). The safety-related SSCs are available following an operating basis earthquake (OBE) to shutdown the plant and maintain it in a safe condition. As discussed in DCD Subsection 3.10.1.2 an equipment qualification data package (EQDP) is developed for the instrumentation and electrical equipment classified as seismic Category I. Table 3.11-1 of Section 3.11 identifies the seismic Category I electrical equipment and instrumentation supplied for the AP1000. In addition to the information in the DCD, specifications and other design and procurement documents identify the equipment classification and seismic categorization of AP1000 systems and components. This information is available to operators of AP1000 nuclear power plants.

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As noted in DCD Section 3.7 the operating basis earthquake has been eliminated as a design requirement for the AP1000. Criteria for evaluating the need to shut down the plant following an earthquake are established using the cumulative absolute velocity approach according to EPRI Report NP-5930 and EPRI Report TR-100082. As noted in DCD Section 3.7, for the purposes of the shutdown criteria in NP-5930, the operating basis earthquake for shutdown is considered to be one-third of the safe shutdown earthquake. Note: because the operating basis earthquake is one-third of the safe shutdown earthquake the criteria of 10 CFR Part 50, Appendix S, IV(a)(2)(i)(A) applies and the criteria of Part 50, Appendix S, IV(a)(2)(i)(B) and IV(a)(2)(i)(B)(I) do not apply

In the event of a seismic ground motion meeting criteria in 10 CFR Part 50, Appendix S the plant may need to be shut down. Prior to resuming operations, the licensee must demonstrate to the Commission that no functional damage has occurred to those features necessary for continued operation. DCD Tables 3.2-3 and 3.11-1 tabulate the safety-related systems and components that must be considered in an inspection and evaluation performed to demonstrate that no functional damage has occurred. Information is added to DCD Subsection 3.2.1.1, as shown below, to specify that the systems and components tabulated in Table 3.2-3 as Equipment Class A, B, and C or identified in Table 3.11-1 as requiring seismic qualification are the systems and components necessary for continued operation in conformance with the applicable criteria in 10 CFR Part 50, Appendix S.

The capability of nonsafety-related SSCs to support power production following an OBE is an investment protection issue. Continued operation of the power production equipment is not required to protect the public health and safety. The systems and components important to reliable power production and which provide defense in depth functions are included in the D-RAP table in DCD Table 17.4-1. Seismic Category II structures, systems, and components are designed so that the safe shutdown earthquake does not cause unacceptable structural failure of or interaction with seismic Category I items. Operability is not required to be demonstrated for seismic Category II systems and components.

Post earthquake planning is the responsibility of the operators of the nuclear power plant and is not included in design certification.

Design Control Document (DCD) Revision:

Add the following to Subsection 3.2.1.1 ahead of the last paragraph.

Systems, and components identified as safety-related systems and components in Table 3.2-3 and electrical and instrumentation components identified in Table 3.11-1 are the systems, and components necessary for continued operation that must remain functional without undue risk of the health and safety of the public during and following an operating basis earthquake. Systems and components identified as Equipment Class A, B, and C in Table 3.2-3 and

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electrical and instrumentation components identified in Table 3.11-1 are the systems and components that per the criteria of 10 CFR Part 50, Appendix S, must be demonstrated, prior to resuming operations, to have no functional damage following a seismic ground motion exceeding the operating basis earthquake ground motion. See Section 3.7 for information on the operating basis earthquake.

PRA Revision:

None

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RAI Response Number: OI-SRP3.2.2-EMB2-01

Revision: 0

Question:

The staff reviewed the applicant's response to RAI-SRP3.2.2-EMB2-01 and determined that the response partially, but not entirely, resolves the staff's concerns. Although the PRA and RTNSS process did not apparently identify any supplemental requirements for passive components, the staff is concerned that supplemental requirements may be appropriate, especially where there is an insufficient operating history. For example, where high density polyethylene (HDPE) piping is to be used for underground plant service water piping that is considered a risk-significant, defense-in-depth RTNSS system, additional special treatment should be imposed on design and QA requirements to ensure its integrity consistent with the system's safety function. Special treatment is appropriate for buried non-metallic piping that does not have a sufficient operating history in similar applications where failures are possible, unless special precautions are taken during design, fabrication, installation and testing. Examples of supplemental requirements applied to important to safety HDPE piping are addressed in ASME Code Cases and relief requests. Although the plant service water piping is not considered safety-related, it does have an importance to safety and GDC 1 requires that, where generally recognized codes and standards are used, they shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. Therefore, the Staff believes that passive SSCs used in risk-significant RTNSS systems such as the PSWS piping should have supplemental requirements applied.

Westinghouse Response:

Westinghouse has reviewed the staff's concern and understands how the lack of sufficient operating experience can increase concern over the application of alternate materials in an application important to safety. Furthermore, after reviewing the staff comments, it has been identified that the request for supplemental requirements for application to passive SSCs used in risk significant RTNSS systems has been specifically directed towards the AP1000 application of alternate pipe materials in the plant service water system (SWS).

It should be observed that the use of alternate materials has not been applied to the process flow paths required to satisfy the function of decay heat removal, which has been evaluated as important to safety. High density polyethylene (HDPE) piping has been used in the SWS strainer backwash and blowdown flow paths. The SWS suction and discharge lines from the SWS mechanical draft cooling towers are designed to be carbon steel in accordance with the ASME B31.1 "Power Piping" code as described in AP1000 DCD Subsection 3.2.2.6.

The SWS strainer backwash and blowdown flow paths represent isolable flow paths that are not required to support the important to safety function of decay heat removal. Therefore, the application of HDPE, although classified as AP1000 Class D, is not a contributor to the RTNSS-

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important function of decay heat removal. Therefore, Westinghouse has concluded that supplementary requirements are not required in the application of HDPE piping in the SWS.

Design Control Document (DCD) Revision:

None

PRA Revision:

None