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Your ref: Project Number 740
Our ref: DCP/NRC1840

February 26, 2007

Subject: AP1000 COL Response to Request for Additional Information (TR #3)

In support of Combined License application pre-application activities, Westinghouse is submitting a response to an NRC request for additional information (RAI) on AP1000 Standard Combined License Technical Report 3, APP-GW-S2R-010, Rev. 0, Extension of Nuclear Island Structures Seismic Analysis. This RAI response is submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in the response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

The response is provided for request TR3-19, transmitted in NRC letter dated December 5, 2006 from Steven D. Bloom to Andrea Sterdis, Subject: Westinghouse AP1000 Combined License (COL) Pre-application Technical Report 3 – Request for Additional Information (TAC No. MD2358).

Pursuant to 10 CFR 50.30(b), the responses to requests for additional information on Technical Report 3 are submitted as Enclosure 1 under the attached Oath of Affirmation.

It is expected that when the RAIs on Technical Report 3 are complete, the technical report will be revised as indicated in the response and submitted to the NRC. The RAI response will be included in the document.

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 cursive script, appearing to read 'Andrea Sterdis'.

A. Sterdis, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Attachment

1. "Oath of Affirmation," dated February 26, 2007

/Enclosure

1. Response to Request for Additional Information on Technical Report No. 3

cc:	S. Bloom	- U.S. NRC	1E	1A
	S. Coffin	- U.S. NRC	1E	1A
	G. Curtis	- TVA	1E	1A
	P. Grendys	- Westinghouse	1E	1A
	P. Hastings	- Duke Power	1E	1A
	C. Ionescu	- Progress Energy	1E	1A
	D. Lindgren	- Westinghouse	1E	1A
	A. Monroe	- SCANA	1E	1A
	M. Moran	- Florida Power & Light	1E	1A
	C. Pierce	- Southern Company	1E	1A
	E. Schmiech	- Westinghouse	1E	1A
	G. Zinke	- NuStart/Entergy	1E	1A

ATTACHMENT 1

“Oath of Affirmation”

ATTACHMENT 1

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of:)
NuStart Bellefonte COL Project)
NRC Project Number 740)

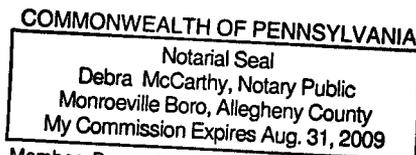
APPLICATION FOR REVIEW OF
"AP1000 GENERAL COMBINED LICENSE INFORMATION"
FOR COL APPLICATION PRE-APPLICATION REVIEW

W. E. Cummins, being duly sworn, states that he is Vice President, Regulatory Affairs & Standardization, for Westinghouse Electric Company; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission this document; that all statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

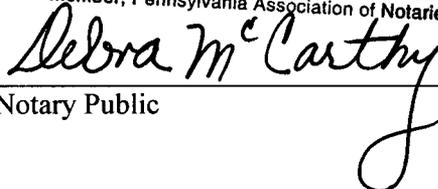


W. E. Cummins
Vice President
Regulatory Affairs & Standardization

Subscribed and sworn to
before me this 28th day
of February 2007.



Member, Pennsylvania Association of Notaries


Notary Public

ENCLOSURE 1

Response to Request for Additional Information on Technical Report No. 3

RAI-TR03-019

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-TR03-019

Revision: 0

Question:

The section of "DCD Subsection 2.5.2.3 - Sites with Geoscience Parameters Outside the Certified design" states that final design verifications were based on 3D SASSI results with 2D results used to test sensitivity only. The final verification for a site not satisfying the site criteria should be based on 3D SASSI results. Westinghouse should justify how does one judge the adequacy of 2D SASSI results without performing 3D computations.

Westinghouse Response:

Westinghouse agrees that 3D SASSI analyses are required for sites with geoscience parameters outside the certified design. This section of the report is revised as shown below. Use of 2D SASSI is intended to provide justification where necessary that a local feature of the site fits within the certified design. For such cases 2D SASSI analyses can be performed and the results compared against the 2D SASSI results for the four design cases (HR, FR, UBSM, SM) to justify that the site specific data are bounded by the four design cases.

2D SASSI analyses are appropriate to demonstrate that local features, such as soil degradation properties or backfill, are bounded by the design cases.

Design Control Document (DCD) Revision:

DCD revisions are not shown for each RAI. A single set of proposed revisions is given in the response to RAI-TR03-013. The revisions are based on the material in the technical report as well as in the RAI responses. The revisions include changes to Section 3.7 and the addition of a new Appendix 3G providing a summary of the seismic analyses.

Revisions to DCD Section 2.5 were included in APP-GW-GLR-044, Rev 0, "Nuclear Island Basemat and Foundation", October 2006. The revision to subsection 2.5.2 is further revised as shown below. The revisions also show those identified in this section in the response to RAI-TR03-018. The revision marks show revisions from the existing DCD.

2.5.2 Vibratory Ground Motion

The AP1000 is designed for a safe shutdown earthquake (SSE) defined by a peak ground acceleration (PGA) of 0.30g and the design response spectra specified in subsection 3.7.1.1, and Figures 3.7.1-1 and 3.7.1-2. The AP1000 design response spectra were developed using the Regulatory Guide 1.60 response spectra as the base and modified to address high frequency amplification effects observed in eastern North America earthquakes. The peak ground accelerations in the two horizontal and the vertical directions are equal.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

2.5.2.1 Combined License Seismic and Tectonic Characteristics Information

Combined License applicants referencing the AP1000 certified design will address the following site-specific information related to the vibratory ground motion aspects of the site and region:

- Seismicity
- Geologic and tectonic characteristics of site and region
- Correlation of earthquake activity with seismic sources
- Probabilistic seismic hazard analysis and controlling earthquakes
- Seismic wave transmission characteristics of the site
- SSE ground motion

The Combined License applicant must demonstrate that the proposed site meets the following requirements:

1. The free field peak ground acceleration at the ~~foundation-finished grade~~ level is less than or equal to a 0.30g SSE.
2. The site design response spectra at the ~~foundation-finished grade~~ level in the free-field are less than or equal to those given in Figures 3.7.1-1 and 3.7.1-2.
3. In lieu of (1) and (2) above, for a site where the nuclear island is founded on hard rock with shear wave velocity greater than 8000 feet per second and there are thin layers of soft material overlying the rock, the site specific peak ground acceleration and spectra may be developed at the top of the competent rock and shown at the foundation level to be less than or equal to those given in Figures 3.7.1-1 and 3.7.1-2.
4. Foundation material layers are approximately horizontal (dip less than 20 degrees) and the shear wave velocity of the soil is greater than or equal to 1000 feet per second.

Where features of the site are not clearly within the parameters specified for the AP1000, site-specific soil structure interaction analyses may be performed using the 2D SASSI models described in Appendix 3G for variations in site conditions that can be adequately represented in these models. Results should be compared to the results of the 2D SASSI analyses described in Appendix 3G. Such analyses may be used to demonstrate that local features, such as soil degradation properties or backfill, are bounded by the design cases.

2.5.2.2 Site-Specific Seismic Structures

The AP1000 includes all seismic Category I structures, systems and components in the scope of the design certification.

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

2.5.2.3 Sites with Geoscience Parameters Outside the Certified Design

If the site-specific spectra at foundation level exceed the response spectra in Figures 3.7.1-1 and 3.7.1-2 at any frequency, or if soil conditions are outside the range evaluated for AP1000 design certification, a site-specific evaluation can be performed. This evaluation will consist of a site-specific dynamic analysis and generation of in-structure response spectra to be compared with the floor response spectra of the certified design at 5-percent damping. The site design response spectra at the foundation level in the free-field given in Figures 3.7.1-1 and 3.7.1-2 were used to develop the floor response spectra. They were applied at foundation level for the hard rock site and at finished grade level for the soil sites. The site is acceptable for construction of the AP1000 if the floor response spectra from the site-specific evaluation do not exceed the AP1000 spectra for each of the locations identified below:

<u>Containment internal structures at elevation of reactor vessel support</u>	<u>Figures 4.4.3-1 to 4.4.3-3*</u> <u>Figure 3G.4-5</u>
Containment operating floor	<u>Figures 4.4.3-4 to 4.4.3-6*</u> <u>Figure 3G.4-6</u>
<u>Auxiliary building NE corner at control room ceiling</u>	<u>Figures 4.4.3-7 to 4.4.3-9*</u> <u>Figure 3G.4-7</u>
Shield building at fuel building roof	<u>Figures 4.4.3-10 to 4.4.3-12*</u> <u>Figure 3G.4-8</u>
Shield building roof	<u>Figures 4.4.3-13 to 4.4.3-15*</u> <u>Figure 3G.4-9</u>
Steel containment vessel at polar crane support	<u>Figures 4.4.3-16 to 4.4.3-18*</u> <u>Figure 3G.4-10</u>

** DCD Section 2.5 will reference the figures in Appendix 3G (see proposed new DCD Appendix 3G provided in the response to RAI-TR03-013). The Figures in 3G are the same as those in Section 4.4 of the technical report. Both figure numbers are shown for information in this draft revision of DCD Section 2.5.*

Site-specific soil structure interaction analyses should be performed using the 3D SASSI nuclear island building models described in Appendix 3G. The sSite-specific soil structure interaction analyses must be performed by the Combined License applicant to demonstrate acceptability of sites that have seismic and soil characteristics outside the site parameters in Table 2-1. These analyses would use the site-specific soil conditions (including variation in soil properties in accordance with Standard Review Plan 3.7.2). The three components of the site-specific ground motion time history must satisfy the regulatory requirements for statistical independence and enveloping of the site design spectra at 5% damping enveloping criteria of Standard Review Plan 3.7.1 for the response spectrum for damping values of 2, 3, 4, 5, and 7 percent and the enveloping criterion for power spectral density function. Floor response spectra determined from the site-specific analyses should be compared against the design basis of the AP1000 described above. Member forces in each of the sticks should be compared

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

~~against those given in Tables 3.7.2-11 to 3.7.2-13.~~ These evaluations and comparisons will be provided and reviewed as part of the Combined License application.

PRA Revision:

None

Technical Report (TR) Revision:

The Technical Report will be revised to include the RAI responses in an appendix. Thus the proposed DCD revisions will also become a part of the technical report. Also, revise the proposed changes to the DCD in section 5.0 as follows:

DCD Subsection 2.5.2.1 Combined License Seismic and Tectonic Characteristics Information

The Combined License applicant must demonstrate that the proposed site meets the following requirements:

1. The free field peak ground acceleration at the finished grade level is less than or equal to a 0.30g SSE.
2. The site design response spectra at the finished grade level in the free-field are less than or equal to those given in Figures 3.7.1-1 and 3.7.1-2 (*these spectra are shown in Figures 2.1-1 and 2.1-2 of this report*).
3. In lieu of (1) and (2) above, for a site where the nuclear island is founded on ~~competent~~ hard rock with shear wave velocity greater than ~~3500-8000~~ feet per second and there are thin layers of soft material overlying the rock, the site specific peak ground acceleration and spectra may be developed at the top of the competent rock and shown at the foundation level to be less than or equal to those given in Figures 3.7.1-1 and 3.7.1-2.
4. Foundation material layers are approximately horizontal (dip less than 20 degrees) and the shear wave velocity of the soil is greater than or equal to 1000 feet per second.

Where features of the site are not clearly within the parameters specified for the AP1000, site-specific soil structure interaction analyses may be performed using the 2D SASSI models described in Appendix 3G for variations in site conditions that can be adequately represented in these models. Results should be compared to the results of the 2D SASSI analyses described in Appendix 3G. Such analyses may be used to demonstrate that local features, such as soil degradation properties or backfill, are bounded by the design cases.

DCD Subsection 2.5.2.3 Sites with Geoscience Parameters Outside the Certified Design

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

If the site-specific spectra exceed the response spectra in Figures 3.7.1-1 and 3.7.1-2 at any frequency, or if soil conditions are outside the range evaluated for AP1000 Design Certification, a site-specific evaluation can be performed. This evaluation will consist of a site-specific dynamic analysis and generation of in-structure response spectra to be compared with the floor response spectra of the certified design at 5-percent damping. The site design response spectra in the free-field given in Figures 3.7.1-1 and 3.7.1-2 were used to develop the floor response spectra. They were applied at foundation level for the hard rock site and at finished grade level for the soil sites. The site is acceptable for construction of the AP1000 if the floor response spectra from the site-specific evaluation do not exceed the AP1000 spectra given in the figures in subsection 4.4.3 at the following six key locations:

- Containment internal structures at elevation of reactor vessel support
- Containment operating floor
- Auxiliary building on control room side
- Shield building at fuel building roof
- Shield building roof
- Steel containment vessel at polar crane support

~~Site-specific soil structure interaction analyses may be performed using the 2D SASSI models described in subsection 4.4.1 of this report for variations in site conditions that can be adequately represented in these models. Results should be compared to the results of the 2D SASSI analyses described in section 4.4.1.~~

~~Site-specific soil structure interaction analyses should be performed using the 3D SASSI models described in section 4.4.2 of this report for variations in site conditions that can not be adequately represented in two dimensions. Results should be compared to the results of the 3D SASSI analyses described in section 4.4.2.~~

Site-specific soil structure interaction analyses should be performed using the 3D SASSI nuclear island building models described in Appendix 3G. The site-specific soil structure interaction analyses would use the site-specific soil conditions (including variation in soil properties in accordance with Standard Review Plan 3.7.2). The three components of the site-specific ground motion time history must satisfy the enveloping criteria of Standard Review Plan 3.7.1 for the response spectrum for damping values of 2, 3, 4, 5, and 7 percent and the enveloping criterion for power spectral density function. Floor response spectra determined from the site-specific analyses should be compared against the design basis of the AP1000 described above. These evaluations and comparisons will be provided and reviewed as part of the Combined License application.